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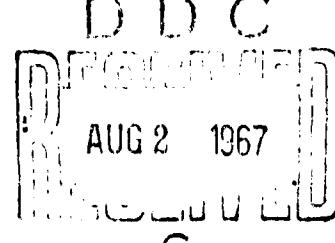
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OFFICE OF CIVIL DEFENSE
OFFICE OF THE SECRETARY OF THE ARMY
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Summary

METHODOLOGY FOR ASSESSING TOTAL VULNERABILITY

This is a study of total vulnerability of the nation to nuclear attack in which the nation is considered as a sociocultural, political, and economic entity. The analysis begins with a systems description of this entity in terms of its three primary parts: the social, political, and economic systems. These parts are analyzed in terms of their major subsystems, most of which have the general nature of institutions. These institutions include the individual as a social, political, and economic man and 23 others as follows:

Language	Pressure group	Labor union
Family or household	Legal system	Business
Group	Political party	Industry
School	Municipality	Corporation
Church	County government	Property
Association	Special district	Markets
Community	State government	Money and credit
	Federal government	Contract

The analysis treats these institutions as interreacting systems. It identifies input and output variables associated with each and indicates to which institutions each variable is an input and from which institutions it is an output. No attempt is made to develop a quantitative model of the whole set of institutions but some of the methodological problems that would be included in any such development are discussed. Some of the variables cited are of a qualitative nature and must be thought of as taking on only discrete values corresponding to different qualities, features, or states. Others are difficult to quantify even in concept. This is particularly true of a class of variables relating to the beliefs, attitudes, values, and opinions of individuals or groups of individuals; a class of variables referred to as BAVOs. Other variables present semantic problems, tending to refer to one thing when regarded as inputs or outputs to one institution and another thing in a different context. Many of the variables would be difficult to scale or to measure.

The systems description has been used primarily to identify aspects of the whole that would be affected directly by an attack and to trace through possible indirect effects. The systems approach has thus identified postattack problems but because it is clouded by semantic and conceptual difficulties mentioned above (and discussed in some detail in

the report), a parallel approach has also been followed providing a more traditional literary description of the major characteristics of the institutions in question. This has provided some assurances of completeness in postattack problem identification.

The possible direct effects of an attack are discussed in terms of two attack extremes: (1) an all-out attack on industrial centers destroying all SMSAs and (2) a minimal counterforce attack causing only collateral damage to certain port cities and SMSAs adjacent to major military targets. Aggregate damage nationally could vary from one- to four-fifths of the nation's preattack productive capacity. The effects of such attacks have been classified into primary effects, including all direct effects together with their immediate consequences, and secondary effects including all longer range consequences of the primary effects. Roughly, this distinction corresponds to a separation of effects into those likely within the first 60 days after an attack and those requiring a longer time for development.

Even the primary effects involve significant organizational problems, particularly in the case of a severe attack in which fuel shortages could immobilize transportation. Intuitive consideration of an appropriate time frame for treating these problems indicates that critical decisions about countermeasures are required within the first two months. This is also true for most of the problems arising from secondary effects even though these, by definition, require more than two months to manifest themselves fully.

In the heavy attack case, the problems engendered could greatly degrade the productivity of surviving industrial capacity and could threaten many characteristic features of our society.

Over and above the uncertainties of the potential attack, the uncertainties with respect to psychological and morale factors and to the likely course of postattack political action make the analysis somewhat inconclusive. Gaps in the research are pointed out including both informational blanks and methodological difficulties. Suggestions are made for ultimately closing some of these gaps. It is clear, however, that organizational and institutional changes could be more significant than loss of productive capacity itself. Such changes could greatly impede recovery and could seriously threaten the viability of our society as a whole.

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METHODOLOGY FOR ASSESSING TOTAL VULNERABILITY

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August 1966

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This report has been reviewed in the Office of Civil Defense and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Office of Civil Defense.

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I INTRODUCTION

Great effort has been devoted to assessing the possible effects of thermonuclear attack on systems believed critical to national survival. But a nation is more than the sum of its parts, and interrelations between critical systems and their supporting subsystems are exceedingly complex--far too complex for ready analysis or intuitive comprehension.

Research on particulars has inevitably raised anxieties concerning (1) the possibility of critical and vulnerable subsystems without which many of the major systems would fail to function and (2) the possibility of the whole failing merely from marginal or subnormal performance of too many parts.

Objective

The objective of this study is to develop methodology for analyzing total vulnerability in the light of these and other difficulties.

Method of Approach

An effort has been made to describe the total system, after the fashion of systems analysis, in terms of major subsystems and their interrelationships. With this approach, systems analysis itself becomes a sort of model or analogy, with the result that the description is at times schematic and is always oversimplified.

Systems analysis is concerned with variables, with relations between them, and with identifying elements internal and external to a system. External elements are relevant only if they are inputs to the system or constraints on it, and inputs can be generated by mechanisms at work either in some other system or previously at work in the same system. In the latter case of feedback variables, conventional practice is to treat them as internal to the system, even though values of corresponding variables generated during one period serve as inputs to some of the relations of the system for subsequent periods.

In discussions of the total system, the concern is with variables identifying, enumerating, classifying, or otherwise measuring characteristics of such elements as the following:

1. People

2. Motivation packages, including
 - a. Cultural values and norms
 - b. State of knowledge
 - c. Adjustments to social and physical environments
3. Decision making entities, such as
 - a. Associations
 - b. Corporations
 - c. Government agencies
4. Procedural packages, including
 - a. Symbols
 - b. Language
 - c. Money and credit
 - d. Law
 - e. Ownership
 - f. Contract
 - g. Worship
 - h. Law making
 - i. Judgments or judicial processes
 - j. Communications
 - k. Elections
 - l. Education
5. Things
 - a. Consumables
 - b. Variables
 - c. Intermediates
 - d. Facilities

The variables associated with such elements are presumed to be related by equations that mathematically describe the operation of the mechanisms governing the system and determining relations between its inputs and its outputs.

This report discusses some of the problems involved in developing equations for such relationships. System relations often include some constraints imposed externally on the system, usually because of larger, more encompassing systems. The state of a system is the set of current values of all its pertinent variables. The phase of the system is the set of current directions and rates of change of such variables--current trends.

In many systems, and perhaps most frequently in social systems, variables may be discretely valued; that is, they may admit only a finite number of values. Some of these discrete variables may be merely identification numbers specifying a particular individual, object, or item, and others may be selection designators symbolizing a choice among alternatives. Variables difficult to measure in an absolute sense may be described in terms of rankings, or in such broad categories as high, medium, and low, and thus represented as discrete variables.

Vulnerability

This study is concerned with total vulnerability, or more precisely with the vulnerability of the totality--the whole nation as a social system. It is thus concerned with developing a methodology for assessing the chances of this system surviving without drastic or significant change in its essential characteristics, without fatal impairment of its capacity for regenerating damaged parts or subsystems, and without sustaining stresses, tensions, or flaws fatal to its normal evolution and its normal processes for adjusting to environmental change.

Special care must be taken to distinguish between fatal turns upsetting the dynamic equilibrium of the system's normal processes of adaption to change, whether internally generated or external. Such long term trends as are involved in population growth, centralization, automation, and urbanization are not fatal, nor are they vulnerability factors as such, though they can have implications for vulnerability assessment.

There is no concern then with the infinitesimal chance that the system would resume and persist on its evolutionary course in directions consistent with its historical development, or only moderately at variance with it. It is conceivable that components or subsystems could be identified that are vulnerable to attack and that their loss would destroy the nation in some important sense. It also is conceivable that other components might be highly vulnerable, but that the system has the clear capacity to restore those components or to get along without them. The assessment of vulnerability, therefore, cannot rest on a mechanical collection of assessments of the vulnerability of separate parts.

Certain key factors of the postattack environment would be certain to affect total vulnerability, regardless of the nature of its relation to the vulnerability of subsystems or parts, since these factors would affect all aspects of vulnerability. These include:

1. Severity of the attack
2. State of war
3. State of the rest of the world
4. Capacity of the sociocultural system to adapt to drastic environmental change
5. Capacity of the system to affect the environment or to re-establish normal capabilities for such control

On the other hand, there are characteristics of the social system that most people would accept as essential--characteristics that must be preserved if the postattack system is to be considered a continuation of the present society. These include, for example, the preservation of liberty and certain constitutionally guaranteed or culturally sanctioned rights and freedoms. They are discussed in detail later in the report.

Plan of Development

The U.S. social system is discussed in terms of three major subsystems--the sociocultural, the political, and the economic. Figure 1 provides a schematic preview of some of the subsystems (or institutions) and their major intersystem connections to illustrate the scope of the undertaking.

To provide focus for discussion regarding the selection of system elements, the systems descriptions are preceded by a brief discussion of the range of possible effects of thermonuclear attack and an indication of the range of possible postattack environments. This is to ensure that the systems descriptions developed properly emphasize all the items that might be directly affected by an attack, and their immediate consequences. Table 1 shows some of the primary and secondary effects of nuclear attack as a preview of this discussion of the postattack environment.

To construct a methodological framework for the analysis of total vulnerability, it is convenient, if only for a checklist of possibly significant interactions, to classify effects into some that are more immediate and others that arise only as consequences of interactions from the primary effects. This distinction, admittedly imprecise, can be conceptualized as a distinction between effects likely to occur in the first month after attack, and called primary effects, and those induced by them.

Table 1 represents an attempt to present such a classification in broad outline, deriving secondary effects on the social, political, and economic systems from expected primary effects on one or another of the systems. In general, quantitative measures of the severity of primary effects can be derived from information on the attack parameters, while estimates of the importance of secondary effects can be derived only from consideration of some model depicting the interactions of major systems. In fact, an adequate model must provide for making such derivations.

The report begins then with a general discussion of the postattack environment, followed by systems descriptions of the sociocultural, political, and economic systems and an attempt to identify their interrelationships. It then derives from these broad systems descriptions general inferences regarding methodology, further measures of total vulnerability, and some requirements for recovery.

FIGURE 1
THE TOTAL SYSTEM AND ITS PRIMARY INSTITUTIONS

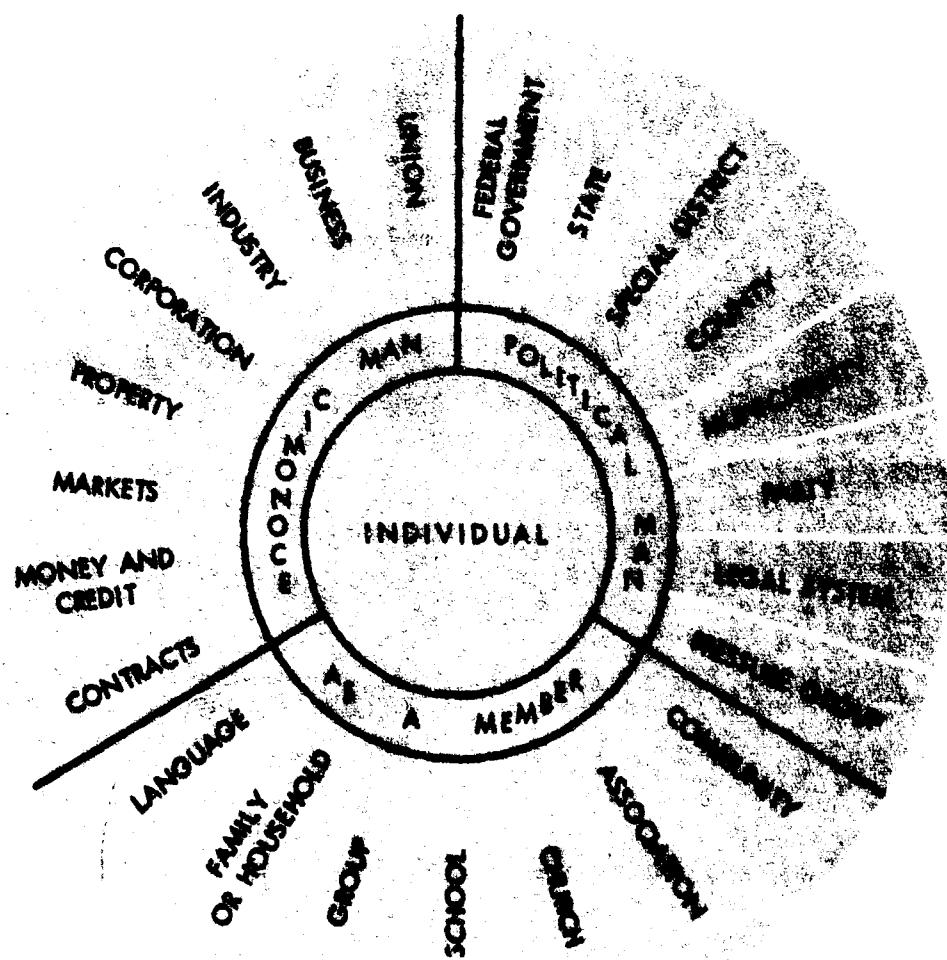


Table 1
PATTERNS OF PRIMARY AND SECONDARY EFFECTS OF ATTACK

Primary Effects		Secondary Effects		
On Sociocultural System	On Sociocultural System	On Political System	On Economic System	
1. Confinement in Shelter Area	Emergent groups & leaders Provincialization	New leadership; questioning electorate Increased role of local government Changes in influence	Loss of production Loss of labor force mobility	
2. Changes in status Individuals	Suicides, opportunists	Individuals	Structural unemployment, indigency	
	Groups Parents & leaders	Groups Parental responsibility Weakening of social structures Weakening of family; orphans	Management changes Labor force composition Marketing adjustments	
3. Family separation & death		Delinquency		
4. Demographic changes	New social pressures	New political alignments	Consumer demands shifts, changes in composition & requirements for labor force	
5. Decreased urbanization	Provincialization	Localization of effective control		

Table 1 (continued)

Primary Effects	Secondary Effects			
	On Sociocultural System	On Sociocultural System	On Political System	On Economic System
6. Loss of social facilities Religious	Weakening of social restraints	Crime, delinquency, & boredom		Loss of morale & productivity Increased cost of business
Cultural Educational	Problems of leisure Loss of civic responsibility	Weakening of electorate	Changing markets Weakening of labor force	Changed pattern of demand
7. Disruption of associations	Homogenization vs new kinds of fringe groups Loss of welfare services, safeguards	Political realignments	Disruption of old guides for political leadership	Changed price demand relationships
8. Disruption of familiar social relationships, values, & norms	Unstable goals & standards		Susceptibility to demagoguery	Changed attitudes towards hazardous occupations & changes in productivity
9. Exposure to risk & sight of death & destruction	Psychotic reactions; dehumanization			Increased uncertainty to title & other law suits, loss of basis for trust & credit
10. Loss of government sites & supporting facilities	Loss of welfare services Increase in crime		Loss of government effectiveness, slowdown of government processes	

Table 1 (continued)

Primary Effects	Secondary Effects		
	On Sociocultural System	On Political System	On Economic System
11. Shifts in power relationships between federal, state, & local government	Increased local self dependence	Slow restoration of federal power	Uncertainty in loss sharing
Executive, legislative	Uncertainty in legal compliance & law enforcement	Weakening of judicial process, strengthening of executive branch	Uncertainty in management certification Uncertainty in titles, court issues
Civil vs military law			
12. Disruption of normal legislative representation & election machinery	Civic apathy: Fanaticism	Malapportionment, reorganization of election machinery voter apathy, fanaticism	Uncertainty in tax policy, trade regulations, compliance
13. Shifts in power among pressure groups (minority & dissident groups)	Shifts in location, severity & scope of racial & ethnic friction	Readjustment of party composition & platforms, new parties (or "isms")	Shifts in consumer demand & quality standards
Political demography			
14. Physical damage & loss of capacity & wealth	New demands for social welfare Multifamily housing	General unrest, new claims for welfare & justice	Reduction in GNP
15. Bankruptcy	Social stress, change & uncertainty of status	Legal snarls, legislative workload	Financial instability, inflation
16. Loss or imbalance in labor force, changes in its composition	Structural employment status changes	Increased welfare & crime problems	Reduced productivity of labor & capital

Table 1 (concluded)

Primary Effects	Secondary Effects		
	On Sociocultural System	On Political System	On Economic System
17. Changes in effective demand	Increased interclass mobility Provincialization	Increased local influence Legal problems	Reduced productivity Increased costs
18. High cost of transport	Loss of mutual trust		Loss of decision making effectiveness
19. Disruption of corporate management	Change in status systems New class of expeditors	Need for abnormal government functions, distribution	Lower productivity, increased costs
20. Disruption of market channels			

II SUMMARY AND CONCLUSIONS

Examination of literature on the social system, political system, and systems analysis failed to uncover a single attempt to carry out a quantitative systems analysis of the social system as a whole, or of any of its three major subsystems.

The work that has been done on economic models has facilitated preparation of a systems description of the economic system, but even there, some of the important organizational and institutional aspects of the system have received little attention. The present effort to apply systems analysis to the study of total vulnerability has proved more of a pioneering effort than first expected, and this is reflected in the rudimentary character of the analysis and the models presented.

The results obtained, however incomplete, indicate that a systems analysis can provide some insights into the structure of our society and the nature of its intrinsic vulnerabilities. Clearly, this first effort has merely stated the problem, sketched an approach to it, and at best provided some questions and conjectures that need attention. It has suggested that some of the most important effects of a massive attack may not come from the direct effects on property and capacity but from the indirect effects on institutions and attitudes.

Some of the dangers uncovered relate to matters that could benefit greatly from preattack planning. Others relating to psychology appear to present difficult research problems for which no ready approaches provide much promise of success. Some of the problems have been long recognized. Others may be novel.

Many of the suggestions for further research lie outside the field of competence of the authors. Approaches suggested in delineating the problem may therefore appear unsophisticated to specialists. The purpose will have been served, however, if these suggestions stimulate appropriate specialists to think about these problems and come up with more tractable methods of approach.

The important problems to be solved in the postattack period appear to be the following, listed in the order of possible resolution, and thus inversely to their persistence:

Before or on emergence from shelter:

1. Restoration of communication
2. Restoration of power
3. Rationing of fuel for optimum use in transportation
4. Repair and restoration of adequate transport facilities

Early postattack period:

5. Organization of optimum transport service
6. Restoration of fuel production
7. Improvisation of adequate housing or shelter
8. Working out equitable system of billeting or assignment to community housing
9. Reorganization of a school system
10. Reorganization of a distribution system
11. Reorganization of a system of credit, of credit rating, and of check clearance

Early recovery period:

12. Stabilize the ratio of prices of consumer goods to capital goods--essentially the ratio of consumables to durables
13. Devise incentives for a high savings ratio
14. Develop a feasible schedule for restoring needed productive capacity in less critical industries thus far neglected and proceed with the recovery program thus scheduled
15. Complete plans for loss equalization, if any, and set up necessary administrative and legal machinery
16. Rectify legislative malapportionment
17. Plan and publicize a program for relaxing emergency government controls on the economy and restoring normal controls
18. Plan and publicize a long term housing program
19. Plan and publicize educational and welfare programs to meet the then-recognized social needs
20. Plan and publicize an integrated tax and budget program

In coping with postattack problems, society could be forced to abrogate or restrict many long recognized individual rights and to accept and even accelerate changes in major institutions. Because most people would regard most of the attack induced changes as undesirable, appropriate countermeasures should be devised.

The methodology required to assess the likelihood of such changes and to evaluate the probable effectiveness of countermeasures remains

undeveloped. It is certain to be complex. The systems analysis developed in this study provides a series of checklists for identifying problems and points of relationship, but not for establishing in a quantitative fashion the nature of the relationships that could affect the likelihood of particular changes and the feasibility and effectiveness of countermeasures.

For definitive analysis of such questions, some more precise models of society appear essential for projection into the postattack environment. Important gaps in knowledge make the task of designing satisfactory models appear very difficult. These gaps include lack of requisite factual data, adequate theory, and tested methodology. The suggested approach to an acceptable resolution of this impasse is an integrated program of research employing a variety of different modelling techniques and a combination of qualitative and quantitative analysis.

What factors must be considered in designing a model or set of models for studying total vulnerability or some aspect of it? Relevant inputs include such different things as beliefs, attitudes, values, and opinions, which are referred to collectively as BAVOs; social norms; laws, contracts, corporations, and more tractable concepts, such as budgets, expenditures, facilities, and debts. Questions of timing can be important along with questions of geography. Bottlenecks can be important along with specific critical items.

Although systems analysis has been used to arrange these inputs into a frame of reference, it seems clear that no model or simulation, however vast, could usefully encompass or faithfully distill the essence of the whole U.S. society. The most promising strategy is therefore to sample combinations of problems to be interrelated in submodels and analyzed partially, and then to return them in simplified or more aggregative form to a general structure. This strategy consists of charting the whole and surveying particular areas at higher magnification.

This report considers, in a sense, what the recovered society might look like by developing criteria for acceptable recovery. One method of organizing the program of more careful research would be to move back from recovery to describe plausible postattack conditions from which recovery is possible and to use these conditions to identify other conditions from which recovery appears impossible. Another method would be to concentrate on the early postattack period--say the first two months--and look for problems and countermeasures that bear on the separation of conditions into those favorable and unfavorable to eventual recovery.

Restriction to the early postattack period does not simplify things greatly, since many of the problems identified appear almost from the outset. High priority, however, should be given to politico-economic problems regarding economic organization and to socioeconomic problems regarding the status of individuals and family units.

A logical first step would be to attack particular problems that might be partially isolated from the total system and to test other techniques

for treating those selected. Although the best techniques for considering some areas might not be feasible for others, a few selected case studies could clarify the relative merits of such different approaches as reasoning from abstract microtheory, construction of quantifiable macromodels, and experimentation with gaming or other computerized simulators.

III POSTATTACK ENVIRONMENTS

To identify some of the possible sociocultural, political, and economic consequences of a thermonuclear attack, the case of a counterforce attack is contrasted with a case that includes heavy attacks on primary or critical industrial, metropolitan, and governmental targets. The range of possible attacks and associated consequences are both broad, but not as broad as might be believed.

A small but significant portion of the nation's productive capacity is widely dispersed and lies outside the standard metropolitan statistical areas (SMSAs). This normally produces from 20 to 25 percent of manufacturing output and a larger share of GNP. Fallout can delay access to part of these facilities, but even heavy attacks cannot destroy or long deny access to at least a tenth of normal capacity. Thirty-seven percent of the population lives outside the SMSAs. Approximately 30 percent of the population employed in public administration live outside SMSAs, and 18 state capitols are outside the SMSAs.

On the other hand, many strategic military targets are located near enough to industrial complexes and population centers that a counterforce attack would produce collateral damage accounting for 15 to 20 percent of national capacity. Approximately 10 percent of the population would be killed in such an attack.

Any attack, however designed, is thus almost certain to damage somewhere from 10 to 90 percent of the national capacity. Although this range is too wide for definitive statements, it rules out, on the one hand, the threat of immediate total annihilation and, on the other hand, any prospects of business as usual.

Without trying to trace through the consequences of any specific attack, some insight into the assessment of total vulnerability can be gained by considering some of the similarities and contrasts associated with the extreme cases. These limit cases moreover are much easier to analyze than intermediate situations with a variety of alternatives.

Maximum Attack

In the case of the maximum conceivable attack, it can be assumed that maximum damage was achieved. Specifically, assume that Washington, D.C., has been completely destroyed along with all the other SMSAs, some state capitals of importance, all major port facilities and jet airport terminals, and most of the major railroad marshalling yards, along with a few mountain defiles or central tunnels at critical locations, and all

gasoline refineries. Fallout may have covered three-fourths of the country to significant levels and denied access to most of the agricultural land for varying periods.

Under the assumption of complete destruction of the SMSAs and some peripheral damage, as much as 80 or 90 percent of industrial capacity could have been lost. The geographical distribution of damage can be inferred from Table 2, which summarizes 1957 data on the distribution of value added by manufacture. The loss of housing can be inferred from population data listed in Table 3 and implies that at least 80 percent of preattack housing could be lost.

The uncertainties that surround intermediate attack situations tend to disappear at the extremes. Uncertainty remains, however, even in the case of maximum attack, regarding the number and condition of survivors, since survivability depends on warning and primarily on the passive defense measures available and used. The possibilities range from 40 to 180 million survivors for the severe attack with the upper limit possible only if there are adequate blast shelters and they are occupied. The spread of 4 to 1 in survivors from the maximum attack greatly affects the prospects for a viable economy because of the number of people to be supported at one limit and the probable shortage of technical skills at the other.

Although many inventories of food, materials, and finished products would be destroyed or severely contaminated, usable foodstuffs would survive in supplies adequate for many months and basic materials would be available, although distribution would not be uniform, and severe shortages would develop in some areas.

The most striking shortages would be in forms of facilities--residential, commercial, institutional, and industrial--and in all forms of transportation. Automobiles would be largely immobilized. Trucks, locomotives, farm tractors, and other heavy motor equipment would be short of fuel. Many areas would be cut off from the outside world, and rescue operations would be required to move survivors from shelters to join postattack concentrations of people in safer places. In a few days or weeks, however, national communication and power-transmission systems could be made operable again and some return to normal mail service could be made. The absence of traffic movement would be startling, however, and for a long time the country could be broken up into local areas with virtually no possibility for heavy freight movement between areas.

Analyses of the viability of the economy have disclosed no insurmountable obstacles to eventual economic recovery, even in cases of greatest stress. In most cases, recovery management is critically important, and many political and social problems would threaten survival if not dealt with promptly and effectively.

In the heaviest attack, the loss of familiar landmarks, relationships, and dependencies would be unsettling to survivors. For many people, these

Table 2
VALUE ADDED BY MANUFACTURING OUTSIDE THE SISAS
LARGE PLANT DATA FOR 1957 BY STATE AND TYPE OF INDUSTRY
(Dollars in Millions)

State	Outside SISAS			State Total			Percent Outside SISAS			Survival	Military	Other	Total				
	Recovery and		Other	Total	Survival		Other	Total									
	Military	Support			Recovery and	Military	Support										
Connecticut	\$ 121	\$ 131	\$ 138	\$ 380	\$ 801	\$ 1,810	\$ 383	\$ 2,975	15 %	7 %	38 %	13 %	82 %				
Maine	92	51	241	384	119	66	283	467	77	77	85	85	82				
Massachusetts	0	0	42	1,001	1,458	1,279	3,738	0	0	0	3	1	1				
New Hampshire	55	64	109	229	97	93	176	365	57	69	62	63	63				
New Jersey	45	40	133	222	1,892	2,378	5,588	5,858	3	2	8	4	4				
New York	325	365	546	1,469	2,494	4,953	2,866	10,313	13	12	18	14	14				
Rhode Island	0	0	19	19	137	161	217	515	0	0	9	4	4				
Vermont	32	70	44	146	32	70	44	148	100	100	100	100	100				
Delaware	13	0	49	62	53	178	130	361	25	0	38	17	17				
Washington, D.C.	0	0	0	0	45	--	56	101	0	0	0	0	0				
Kentucky	162	172	72	444	436	792	527	1,755	44	23	14	25	25				
Maryland	57	102	107	266	386	1,215	341	1,942	15	8	31	14	14				
Ohio	476	944	432	1,852	2,453	7,029	1,700	11,182	19	13	25	17	17				
Pennsylvania	321	703	447	1,471	2,326	5,943	2,619	10,488	14	13	17	14	14				
Virginia	234	108	724	1,065	371	214	1,141	1,726	63	51	63	62	62				
West Virginia	101	56	155	312	384	420	258	1,082	28	13	60	29	29				
Alabama	153	123	261	548	287	648	504	1,438	53	21	52	38	38				
Florida	32	55	338	424	130	151	500	781	25	36	68	54	54				
Georgia	150	45	486	682	346	390	903	1,640	43	12	54	42	42				
Mississippi	134	114	128	387	153	114	157	424	88	100	88	91	91				
North Carolina	112	107	895	1,115	229	160	2,080	2,470	49	67	43	45	45				
South Carolina	30	18	615	663	60	31	1,086	1,187	50	58	56	56	56				
Tennessee	214	186	285	695	510	620	619	1,748	42	30	48	40	40				
Illinois	440	455	294	1,190	2,502	5,951	1,960	10,412	18	8	15	11	11				
Indiana	408	791	317	1,516	1,202	3,116	5,212	34	23	53	29	29	29				
Michigan	263	501	348	1,211	1,486	6,062	1,000	8,557	19	10	35	14	14				
Minnesota	233	59	104	386	481	654	336	1,472	49	9	31	27	27				
Wisconsin	322	560	451	1,333	947	1,541	816	3,303	34	36	35	40	40				

Table 2 (concluded)

State	Outside SNSAS			State Total			Percent Outside SNSAS		
	Recovery and Military Support		Other	Recovery and Military Support		Other	Survival		Total
	Survival	Total		Survival	Total		Survival	Total	
Arkansas	\$ 93	\$ 123	\$ 91	\$ 306	\$ 116	\$ 123	\$ 152	\$ 391	80 %
Louisiana	102	211	179	492	425	613	253	1,291	24 %
New Mexico	0	0	21	21	0	99	28	127	--
Oklahoma	57	151	51	289	146	360	87	583	39 %
Texas	568	402	133	1,124	1,357	1,884	839	4,079	43 %
Colorado	30	10	15	54	145	188	250	583	21 %
Iowa	214	208	86	507	440	497	271	1,207	49 %
Kansas	52	121	28	200	202	764	118	1,084	26 %
Missouri	180	64	135	380	837	1,168	548	2,553	22 %
Nebraska	39	19	13	72	218	35	77	330	18 %
North Dakota	0	0	32	32	0	0	32	32	--
South Dakota	11	0	1	12	11	0	1	12	100 %
Wyoming	0	35	8	43	0	35	8	43	--
Arizona	0	24	6	31	25	155	68	248	0 %
California	241	60	93	394	1,915	5,213	1,353	8,481	13 %
Nevada	0	0	62	62	0	0	62	62	--
Utah	31	110	4	145	43	248	31	322	72 %
Idaho	62	50	29	141	62	50	29	141	100 %
Montana	33	76	6	114	33	76	6	114	100 %
Oregon	270	0	115	385	346	96	214	658	0 %
Washington	124	277	212	624	277	653	484	1,414	42 %
U.S. total	\$6,719	\$6,120	\$9,122	\$93,961	\$27,936	\$58,409	\$29,063	\$115,408	24.0 %
Percent of total in industry groups	20%	34%	38%	104	24%	51%	25%	100%	

Table 3
POPULATION OUTSIDE SMSAs, BY STATE
(1960)

<u>State</u>	<u>Total</u>	<u>Inside SMSAs</u>	<u>Outside SMSAs</u>	<u>Percent Outside SMSAs</u>
Connecticut	2,535,234	1,966,427	568,807	22.4%
Main	969,265	190,950	778,315	80.3
Massachusetts	5,148,578	4,387,101	761,477	14.8
New Hampshire	606,921	107,637	499,284	82.3
New Jersey	6,066,782	4,787,604	1,279,178	21.1
New York	16,782,304	14,352,693	2,429,611	14.5
Rhode Island	859,488	740,819	118,669	13.8
Vermont	389,881	0	389,881	100.0
Delaware	446,292	307,446	138,846	31.1
Washington, D.C.	763,956	763,956	0	0.0
Kentucky	3,038,156	610,947	2,427,209	79.9
Maryland	3,100,689	2,435,346	675,343	21.8
Ohio	9,706,397	6,748,362	2,958,035	30.5
Pennsylvania	11,319,366	8,813,274	2,506,092	22.1
Virginia	3,966,949	2,020,626	1,946,323	49.1
West Virginia	1,860,421	575,137	1,285,284	69.1
Alabama	3,266,740	1,488,101	1,778,639	54.4
Florida	4,951,560	3,246,828	1,704,734	34.4
Georgia	3,943,116	1,814,069	2,129,047	54.0
Mississippi	2,178,141	187,045	1,991,096	91.4
North Carolina	4,556,155	1,119,210	3,436,945	75.4
South Carolina	2,382,594	768,024	1,614,570	67.8
Tennessee	3,567,069	1,632,747	1,934,342	54.2
Illinois	10,081,158	7,754,932	2,326,226	23.1
Indiana	4,662,498	2,241,307	2,421,191	51.9
Michigan	7,823,194	5,720,692	2,102,502	26.9
Minnesota	3,413,864	1,752,698	1,661,166	48.6
Wisconsin	3,951,777	1,828,871	2,122,906	53.7
Arkansas	1,786,272	341,351	1,444,921	80.9
Louisiana	3,257,022	1,627,157	1,629,865	50.0
New Mexico	951,023	262,199	688,824	72.4
Oklahoma	2,328,284	1,021,610	1,306,674	56.1
Texas	9,579,677	6,072,708	3,506,971	36.8
Colorado	1,753,947	1,191,832	562,115	32.0
Iowa	2,757,537	918,762	1,841,775	66.8
Kansas	2,178,611	813,804	1,364,807	62.8
Missouri	4,319,813	2,499,968	1,819,845	42.1
Nebraska	1,411,330	830,043	581,287	62.4
North Dakota	632,446	66,947	565,499	89.4
South Dakota	680,514	86,575	593,939	87.3
Wyoming	330,066	0	330,066	100.0
Arizona	1,302,161	929,170	372,991	28.6

Table 3 (concluded)

<u>State</u>	<u>Total</u>	<u>Inside SMSAs</u>	<u>Outside SMSAs</u>	<u>Percent Outside SMSAs</u>
California	15,717,204	13,590,821	2,126,383	13.5%
Nevada	285,278	211,759	73,519	28.3
Utah	890,627	600,770	289,857	32.5
Idaho	667,191	0	667,191	100.0
Montana	674,767	152,434	522,333	77.4
Oregon	1,768,687	890,978	877,709	49.6
Washington	2,853,214	1,800,945	1,052,269	36.9
CONUS Total	179,325,671	112,885,178	66,440,493	37.1
Hawaii	632,772	500,409	132,363	20.9
Alaska	226,167	0	226,167	100.0

would include the complete loss of any semblance of a metropolitan environment, the loss of even minimal residential privacy, of ready means of both local and long-haul transportation, of economic and financial stability, of a regular place of employment and even a regular occupation, of habitual forms of recreation, of normal medical care, of familiar sources of supply even for necessities, of normal support from parents, relatives, friends, and local groups and agencies, and the loss or compromise of trusted sources of information and counsel. Businessmen in particular, but others as well, would experience disturbing and subtle changes in familiar institutions and in such bases for mutual trust as methods of establishing or verifying credit, of dealing with others in remote places, of expediting or tracing shipments, or estimating delivery dates. All would suffer from the dehumanizing effects of widespread death, destruction, and suffering, from loss of confidence in traditional leadership and authority, and from loss of the comfort of traditional group loyalties and associations. The transient and temporary nature of many interim measures and makeshift arrangements would be unsettling to many people and would permeate all daily activities, including work, school, shopping, eating, sleeping, sanitation, and personal care.

Traditional economic motivations would be too sluggish to operate in allocating resources and would be supplemented by more direct controls or replaced by some type of detailed decision making and scheduling systems.

An inescapable fact of postattack life would be widespread readjustments of status, status symbols, and values. These readjustments would be evidenced not only in drastic changes in wealth, income, prices (or exchange rates if no ordinary price and market system prevailed in the postattack period) but in political attitudes, social and cultural values, and interpersonal relationships. This is to be expected partly from the greatly altered environment, partly from the uncertain economic status position of every individual.

Stated national policy favors equalization of property losses, but no specific plan has ever been adopted, and even if one had been established, its implementation would remain uncertain. In the absence of any clear plan, the status of most property and debt relations would be in great doubt for a long time. A major problem would be that of establishing some legal and cultural bases for contractual relations and for mutual trust, even in the most minor commercial transactions. These problems could easily be aggravated by the need for defense of the currency and a frantic effort to establish a new monetary system.

Minimum Attack

At the other extreme, a counterforce attack would partially destroy about 30 major concentrations of military airfields and port facilities in SMSAs. This would include retaliatory sites: SAC Headquarters and SAC airbases and missile sites. Principal damage to cities would be in such port areas as Norfolk, New Orleans, San Diego, Los Angeles, and Philadelphia, but other places listed in Table 4 might also be included.

Table 4

**SMSAs SUBJECT TO COLLATERAL DAMAGE IN COUNTERFORCE
ATTACK ON IMPORTANT AIR FORCE AND NAVY BASES**

	Value Added, 1962 (billions)	Population, 1960 (millions)
San Diego	\$ 0.6	1.0
Los Angeles	9.4	7.0
San Francisco	2.5	3.0
Seattle	1.5	1.0
Phoenix	0.4	0.7
Tucson	0.1	0.3
Salt Lake City	0.3	0.4
Denver	0.9	0.9
San Antonio	0.2	0.7
Fort Worth	0.5	0.6
Dallas	1.2	1.0
Oklahoma City	0.2	0.5
Kansas City	1.6	1.0
Shreveport	0.1	0.3
Mobile	0.2	0.3
New Orleans	0.5	0.9
Omaha (SAC Hq.)	0.4	0.5
Charleston, S.C.	0.1	0.2
Norfolk	0.4	0.6
Washington, D.C.	0.4	2.0
Baltimore	2.2	2.0
Wilmington, Del.	0.6	0.4
Philadelphia	5.7	4.0
New York	18.7	11.0
Boston	3.1	3.0
Springfield, Mass.	0.7	0.8
Dayton	1.2	0.7
Columbus	0.8	0.7
Atlanta	<u>1.0</u>	<u>1.0</u>
Total	\$ 88.5	18.6
U.S. Total	\$179.3	
Percent of the U.S. Total	30.7%	

With about 30 percent of its industrial capacity at risk in these cities, the nation might lose some 15 percent of its total capacity. Survivors would comprise 90 to 100 percent of the prewar population, depending on the availability and use of shelters.* About 10 percent of the petroleum value added might be lost, and shipping networks along the two coasts would be degraded. Washington, D.C. would suffer some damage, but few state capitols would be affected.

Politically, the situation would be more critical than any since World War II, but loss of productivity would be easily compensated for by all-out industrial mobilization. Efforts to restrict consumer spending, to combat inflation, and to meet other wartime crises would be necessary, but the overall situation would not differ greatly from previous mobilizations.

To further set the background for the analysis of subsystems, the next section briefly covers some general observations about the U.S. economy relevant to analysis of the postattack situation.

Observations About the Economy Relevant to the Postattack Situation

The obvious and direct economic effects of a severe attack would include the following:

1. Tremendous destruction of property, primarily housing, and commercial, service, and industrial facilities.
2. Disruption of transportation and shortage of fuel for motive power together with an associated disruption of regional specialization and significant breaks in geographical continuity.
3. Drastic reorientation of effective economic demand.
4. General disruption of normal interindustry flows, with chronic bottlenecks resulting from shifts in demand, uneven loss of capacity, and other disruption of usual sources of supply both for finished and for semifinished and producer goods..
5. Shortages of professional and technical manpower in some fields.

* It is conceivable that an attack designed to maximize the fallout hazard, in combination with failure to use even available shelters, could result in many more fatalities. This could produce a situation in which capacity survives in much higher proportion than population, with shortages of specialized skills and manpower but not of material things. This possibility has not been further considered in this report since it does not seem to present serious organizational problems of primary concern in this study.

Equally obvious, but less direct and less physical effects would include:

1. Financial chaos.
2. Deterioration of market channels and general weakening of national and even regional pricing systems.
3. Increased problems of industrial management.
4. Sweeping changes in status of individuals and groups, regions, and industries.

These are essentially the primary economic effects listed in Table 1, somewhat expanded.

The direct effects of loss of equipment, plant, and other facilities would be a great reduction in output, no matter how the facilities are now used. This reduction would not necessarily be in proportion to the damage sustained, since off-setting factors affecting capital productivity are unlikely to balance out. On the one hand, bottlenecks and imbalances resulting from collapse of transportation and general chaos would degrade industrial performance; on the other hand, full employment, multishift operations, and a general conversion of surviving facilities from marginal applications to more urgent, productive uses would tend to increase output over levels otherwise to be expected.

Other unpredictables are those relating to worker morale and labor productivity. The effects of all this on standards of living would depend on the relative size of the surviving population, its composition, and the need to divert a large portion of the total GNP into investments to provide future productive capacity essential for long run survival.

To provide some gross impressions of the magnitudes involved, the distribution of physical capital has been estimated along major lines of economic activity--physical capital including structures, equipment, and inventories.

Arranged according to economic sectors, Table 5 shows a comparison of figures on physical capital reported by corporations in income-tax returns with data on employment, compensation of employees, and contribution to national income. Although corporations contribute only a fraction of the industry total in the agriculture, forestry, and fishing sector, they account for most of the activity in the manufacturing and public-utility sectors, which together hold most of the investment in equipment, plants, and industrial facilities. Figures for manufacturing thus give a good estimate of the holdings of its different subsectors. Corporate figures for petroleum and coal reflect heavy investments in refineries and petrochemical facilities but also include investments in service stations owned by major oil companies. Data by establishments available for December 31, 1957, as part of the 1958 Census of Manufactures are compared with Internal Revenue Service data for 1958-59 in

Table 3

TANGIBLE ASSETS OF CORPORATIONS COMPARED WITH EMPLOYMENT,
EMPLOYEE COMPENSATION, AND QUOTE(S) RELATED TO NATIONAL INCOME

	Tangible Assets of Corporations (1961-62) Book Value of Depreciable Assets		Activity Data		
	Inventory Gross (billions)	Net (billions)	Persons Engaged in Production (millions)	Pull Time Equivalent Employees (millions)	Income Originating in Activity (billions)
All Groups	8453	5860	57.6	48.2	\$285
Agriculture, forestry, fishing	3	2	4.9	2.0	19
Mining	14	7	0.7	0.6	5
Construction	6	3	4.2	2.9	24
Manufacturing	170	103	16.7	16.5	104
Petrol, beverages, tobacco	10	9	1.6	1.6	131
Textiles & apparel	7	2	2.2	2.2	12
Food products	10	8	1.0	1.0	10
Paper & printing	10	10	1.6	1.5	12
Chemicals	20	17	0.9	0.9	10
Petroleum & coal	20	2	0.2	0.2	4
Rubber & plastic	2	2	0.3	0.3	2
Leather	1	1	0.4	0.4	2
Glass, clay, glass	10	9	0.6	0.6	4
Metal	22	19	2.5	2.5	20
Machinery	12	7	3.1	3.1	25
Transportation equipment	7	7	1.5	1.5	17
Other manufacturing	10	7	0.8	0.8	6
Utilities	123	40	3.0	3.0	38
Transportation	37	27	2.6	2.4	19
Communications	32	32	0.8	0.8	9
Other	70	60	0.6	0.6	10
Trade	38	14	13.7	11.3	74
Finance	42	34	3.1	2.7	48
Real estate	20	20	0.8	0.5	28
Other services	10	9	2.4	2.2	17
	16	9	8.3	8.3	54

Note: These figures exclude government and government enterprises, which employed 11.1 million, with total compensation of \$26 billion.

Source: Internal Revenue Service, Corporation Income Tax Returns, 1961-62. Survey of Current Business, July 1964.

Table 6. The census data cover only manufacturing activity and do include depletable assets. These assets are therefore indicated separately as derived from IRS corporation data.

In both tables, the net figures were obtained by deducting accumulated depreciation reserves from gross value of assets in service. Although net holdings provide some notion of the average service life remaining in assets still in service, they should run about half of the gross figures and usually do so for stable industries.*

Damage assessment data usually estimate the fraction of the capacity destroyed in each sector and can be considered as estimating the fraction of normal contribution to income† or value added that would be lost in an attack. These estimates should correspond closely with the fraction of gross assets lost as revalued at constant prices.

They should also reflect the investment of men, materials, and plant capacity that would need to be set aside to reproduce the lost capacity in any specified number of years--the number of manhours, plant years, and total materials required for restoration. Detailed requirements would be levied primarily on the construction industry and industries providing such producer durables as instruments, machinery, and transportation equipment. These industries along with the construction sector would place extra requirements on stone, clay, and glass products, primary metal industries, and fabricated metal products, and on each other to support reconstruction.

As an indication of the relation between capital investment and manufacturing output, gross expenditures on plant and equipment for all manufacturing amounted to \$47.9 billion in the five years from 1953 through 1957, and \$48.7 billion for the five years from 1958 through 1962. The value added from manufacturing was \$121.7 billion for 1953, \$141.5 for 1958, and \$190.4 for 1963. In the more recent period it was necessary to add one dollar in gross investment for every dollar increase in value added. For the earlier period the ratio was less favorable.

Other important losses would relate to residential housing, commercial and public buildings, and military equipment. Values for reproducible assets of such types have been estimated by Raymond Goldsmith. They are included in Table 7 along with estimates of gross and net debt burden.

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- * The most extreme departures from a value of one half for the ratio of net to gross occur in the paper products and printing sectors reflecting heavy postwar investments in long-life facilities. Such data should also provide a first estimate of the effort required to restore any desired fraction of preattack capacity after comparing losses with construction costs at constant prices.
 - † Contribution to income is more net than value added, chiefly because capital consumption is deducted from income but not from value added.

Table 6

**COMPARISON OF CORPORATE AND ESTABLISHMENT DATA
ON DEPRECIABLE ASSETS IN MANUFACTURING
(Billions of Dollars)**

	Census of Manufactures December 31, 1957			IRS 1957-58 Corporate Depreciable Assets		
	Gross Book Value	Depre- ciation	Net Book Value	Gross	Accumu- lative	Depletable Assets
					Net	
Total manufacturing	\$110.5	\$55.6	\$54.9	\$139.8	\$64.2	\$75.5
Food, beverages, tobacco	12.1	6.2	5.9	11.8	5.2	6.5
Textile, apparel	6.0	2.9	3.1	6.5	3.0	3.5
Lumber, wood, furniture	4.0	2.1	1.9	3.3	1.5	1.8
Paper & printing	10.9	4.8	6.1	10.4	4.2	6.1
Chemicals	13.1	6.6	6.5	14.8	6.7	8.1
Petroleum	7.9	4.1	3.8	28.7	13.9	14.8
Rubber & plastics	1.8	1.0	0.8	2.2	1.1	1.0
Leather	0.5	0.3	0.2	0.5	0.2	0.2
Stone, clay, glass	5.2	2.5	2.7	5.5	2.3	2.2
Metals	23.0	12.0	11.0	25.7	12.4	13.3
Machinery	13.5	7.0	6.5	14.0	6.2	7.8
Transportation equipment	9.3	4.6	4.7	12.6	5.5	7.1
Other manufacturing	3.3	1.5	1.8	3.9	1.8	2.1

Sources: Census of Manufactures, 1958. Internal Revenue Service, Corporation Income Tax Returns, 1957-58.

Table 7

REPRODUCIBLE ASSETS AND DEBTS
1958
(Billions of Dollars)

	<u>Gross Reproducible Assets at Replacement Cost*</u>	<u>Net Reproducible Assets at Replacement Cost*</u>	<u>Gross Debt†</u>	<u>Net Debt†</u>
Corporations	\$ 686	\$ 433	\$305	\$256
Farms	170	95	23	23
Other businesses	153	86	47	47
Nonprofit	50	28	--	--
Households	916	513	170	170
Government	<u>325</u>	<u>212</u>	<u>368</u>	<u>284</u>
Total	\$2,301	\$1,368		
Military	226	89		

* Raymond W. Goldsmith, The National Wealth of the United States in the Postwar Period, National Bureau of Economic Research, Princeton University Press, 1962. (Data used are for 1958.)

† U.S. Department of Commerce, Office of Business Economics, Survey of Current Business, July 1960, p. 35. (Data for end of calendar year 1958. Other business debt taken to include multifamily residential and commercial mortgages, plus other nonfarm commercial debt.)

Total losses under the heaviest attack could reach 70 or 80 percent of those listed, or for 1958 might have amounted to over more than \$1.5 trillion. Damage, of course, would be heaviest for government and military sectors and lightest for farms. The fiscal impact of such losses may be appreciated by comparing the debt structure shown in Table 7, noting that approximately \$70 billion of the net government debt was held by households and \$220 billion by business. Households presumably hold the net business debt, and business holds the household debt. Netting out these figures leaves households and business each holding about half the government debt. Each hold almost \$1 trillion in gross reproducible assets. By furnishing equity capital, households own the business.

Table 8 compares the net reproducible assets of corporations with net worth and total assets or liabilities. The net worth of the manufacturing sector appears adequate to sustain the financial losses of plant and office facilities without bankruptcy, but there would be no capital funds for reconstruction. On the other hand, the whole financial sector

Table 8

**NET REPRODUCIBLE ASSETS COMPARED WITH
NET WORTH AND TOTAL ASSETS OR LIABILITIES
(Billions of Dollars)**

	<u>Net Reproducible Assets</u>	<u>Net Worth</u>	<u>Total Assets or Liabilities</u>
All industry	\$338.0	\$389.0	\$1,136.7
Agriculture, forestry, fishing	1.5	2.0	3.6
Mining	7.0	10.1	16.0
Construction	3.9	5.0	14.2
Manufacturing	186.7	161.9	252.1
Utilities	112.1	67.8	137.3
Transportation	34.4	25.2	47.4
Communication	23.0	16.5	28.5
Electricity, gas, water	54.6	26.1	61.4
Trade	39.7	44.8	87.6
Finance	28.7	89.7	606.8
Banking	2.9	24.7	287.9
Insurance	1.6	19.3	143.9
Real Estate	20.9	13.3	45.2
Other	3.3	32.4	129.8
Services	8.2	7.5	18.4
Miscellaneous	0.1	0.3	0.6
All industry less finance	309.3	299.3	529.9

Source: Internal Revenue Service, Corporation Income Tax Returns, 1959-60.

would be seriously strained by the loss of mortgage collateral, and the capital excess position of the household sector would be greatly reduced. Failures in the financial sector, caused primarily by mortgage default, would eliminate savings of many individuals and spread financial stress among householders.

The effect of attack on market prices of securities would be drastic if the market were operable. Even a day of panic would probably be intolerable to the market and to the government alike, and a moratorium on trading would probably occur. Loss of records would cast a cloud over many titles and some liens and mortgages. If these aspects of fiscal chaos were allowed to develop, any productivity that appeared after emergence from shelters would quickly stop, even in undamaged areas.

Financial and organizational factors could greatly degrade the productivity of the country if they were not dealt with promptly and satisfactorily. These and other social and institutional difficulties will be even more important in the postattack period than normally because of the shaky condition of the economy.

Loss of life from attack induced effects would continue for a long time. Although there would be adequate food supplies in stockpiles and surviving inventories, distribution problems and, to a less extent, food processing problems would lead to general malnutrition and to starvation in some areas. Postattack survival efforts would be complicated by general shortages of essential survival items needed particularly during the shelter and shelter-emergence periods and the lack of essential equipment at the right place. Shortages would include lack of hospitals, medical supplies and equipment, medical skill, general repair and decontamination equipment, radiation measuring devices, motive power, demolition materials, and fire fighting equipment.

Serious as these problems would be, they would have dominant importance for only a short time, since the needs served by survival items diminish and disappear after a few months. Loss of wealth in the form of housing, productive facilities, and equipment would have a much longer range effect and could interact with social, cultural, and political forces operating in the postattack period to cause widespread institutional changes. These possibilities are the primary concern of the balance of this report.

IV DESCRIPTION OF THE SOCIOCULTURAL SYSTEM

This chapter represents an attempt to describe the U.S. sociocultural system in terms that could conceivably be put into quantitative form, despite there having been no such description of the social system in general. The description here must therefore be regarded as tentative at best, though it illustrates the form a more sophisticated development could take.

Development of psychological and sociological theory is beyond the scope of this study. In this attempt at a system description of quantifiable form, some new sociological notions may be introduced, or implied. The mere suggestion of the possible form of a quantitative relationship, or the implicit assumption of the dependence or independence of selected variables, might constitute a sociological theory. But since no experimental evidence has been collected, any such theory could be novel but wrong.

The description here is based on extensive but by no means exhaustive search of the literature. The theoretical base, which is certainly eclectic, may prove to be inconsistent or contrary to established fact. But it should serve the purpose of illustrating one method of approach to the analysis of total vulnerability, and it may provide a framework for relating and testing current theory.

Institutions as Systems

The social system involves many major subsystems and subsystems subordinate to them. Two levels of detail appear most promising for practical system definition, and a compromise has been made between them. One treats individuals as the basic unit subsystem and provides a system description for the individual before tracing through the intersystem relationships associating individuals, groups, and larger systems. The other treats institutions as the basic unit subsystem and describes the inputs, outputs, feedbacks, and functions or activities of each type of institution before tracing the intersystem relationships between them. The second more aggregative course is favored here, though individuals are included, but as institutions.

The interpretation of an individual as an institution and an institution as a system requires some defense, particularly because of fuzziness surrounding the different uses of the word institution. A convention has therefore been established for use of the term here. In this study, institution refers to a well established system of norms associated with a set of social arrangements that accomplish some activity or perform

some function. The institution and its associated norms assign roles, condition attitudes, and constrain or impose sanctions on behavior. They include, for example, monogamous patriarchal marriage, consumer credit enforced by credit rating operations, check cashing and clearing, and similar systems of widely accepted arrangements maintained by supporting attitudes, values, and norms. An institution has inputs, outputs, and feedback variables. It does something by processes that can be described quantitatively, using outputs from other systems to produce inputs to other systems.

Table 9 lists the types of institutions of concern here and suggests a classification into three major subsystems corresponding to the three major subsystems of the whole. The division is somewhat arbitrary but roughly separates the sociocultural system from the economic and political systems as usually recognized.

As systems, these institutions have different characters, depending on whether they are predominantly concerned with people, people and things, or arrangements for conducting, organizing, or facilitating activities. The individual himself has subsystems of different character depending on whether they are concerned with biological processes, psychological or emotional processes, and rational, logical, or reasoning processes. The distinction between the extremes of these triads is analogous to the distinction between mechanical or physical systems on the one hand and control systems on the other. In the total system of concern here, however, some of the institutions that serve as control systems have evolved over centuries as manmade social developments. They are themselves controlled by men reacting to the adequacy of these institutions and those they control. The total system is not closed, since it is affected by environmental inputs external to it, but it possesses capabilities for changing aspects of its own structure and the interconnections between its subsystems. Such changes normally take place very gradually, but a thermonuclear holocaust could greatly accelerate the changes or drastically deflect their direction.

Support or opposition to the present forms of such controlling institutions, as well as many of the characteristics of other institutions, derive from the consensus of attitudes and prevailing values of people. In considering the possible longer range effects of an attack on familiar institutions, attention must be given not only to the effects on their immediate material support but also on the support they derive from attitudes and values.

This chapter then is concerned with the first major subsystem, the sociocultural system, its major institutions, and the conventions, norms, and sanctioned behavior patterns associated with them. It is also concerned with the attitudes and values prevalent in the society, their strengths and universality, and their relationships to norms and thus to institutions.

Table 9
MAJOR INSTITUTIONS WITHIN THE TOTAL SYSTEM

Institution	Primary Function or Activity
Sociocultural	
1. Language	Communications
2. Individual	Role playing, value formation
3. Household or family	Earning, spending, and acculturation
4. Group	Socialization
5. School	Education
6. Church	Preservation of faith
7. Association	Joint effort
8. Community	Social pressure
Political	
9. Political man	Choosing representatives
10. Pressure group	Influencing legislation
11. Legal system	Law and order
12. Political party	Candidates and issues
13. Municipality or township	Protection and services
14. County government	Law enforcement and services
15. Special district	Education, resources, fire control
16. State government	Lawmaking, education
17. Federal government	National defense
Economic	
18. Economic man	Labor
19. Labor Union	Collective bargaining
20. Business	Free enterprise
21. Industry	Production
22. Corporation	Joint ventures
23. Property	Utility production
24. Markets	Distribution
25. Money and credit	Financing
26. Government	Taxing, spending, regulating, adjudicating, protecting life and property
27. Contract	Establishes terms and basis for mutual understanding

The Individual as an Institution

The concept of the individual as a system has long been familiar to biologists. Treating the individual as an institution is novel, possibly even farfetched, but it is convenient and defensible, if the individual is considered in all his roles simultaneously. The study could have started with the family or household unit, but instead it has included the individual among the sociocultural institutions to cover his activities independent of the family unit. In this way, a compromise has been made between the major alternatives in selecting a minimal set of subsystems, allowing the interactions of the individual with other institutions where peculiar, to be considered without sacrificing the convenience of aggregation into larger subsystem units for other interactions.

System inputs in the case of the individual include the biological requirements of food, drink, warmth, and shelter, all within fairly limited ranges, in caloric or liquid measures. They include occasional needs for drugs and medicinals. Psychological or psychobiological needs, including sex, ego-enhancement, sympathy, esteem, and other intangibles, are not easy to scale. Pressures on the individual include biological stimuli or drives related to pain, discomfort, and the needs mentioned.

Social pressures include group attitudes conditioned by the different roles imposed on the individual, norms, and sanctions constraining individual activities and behavior patterns. These include pressures to pursue an education or occupation, to marry, and to participate in group activities. Other inputs include accepted rights to earn and dispose of income, to save, to hold property, and to derive income from its services. They include the right to vote, to communicate with others, to move about, to seek employment or engage in business. They include such duties as military service and such obligations as reporting income and paying taxes. Outputs include taxes paid, labor or services performed, savings invested, property sold or rented, effort, time, and money devoted to associations and churches. They include beliefs, attitudes, opinions, and values (BAVs)

Other Sociocultural Institutions

Language

Under language, concern is with the whole system of communication activities: between individuals, individuals and the family, individuals and groups, at different places and different times. The concern is with the spoken and written word as well as gestures, signals, drawings, and other methods of communication, with or without the assistance of such communication technology as radio, TV, the printed word, and tape or other recordings. Inputs to the system are the accumulated literature, communication facilities, communication needs, and conventions of syntax and meaning. Outputs are expressions of interpersonal intent, new literature, and translations of output from one institution into inputs to another.

Household or Family

Concern here is with activities associated with either procreation and rearing the young, satisfaction of sexual needs, economic support for the family, economic activities of its individual members, and family or household needs and wants.

Memberships in associations, voting, earning, some spending, affirmation of values and attitudes, and other individual activities not conducted as a household group, will be associated with the individual as a subsystem or institution as such. Joint activities by the family as a whole will be associated with the family institution. Inputs to the household system include income, purchased goods and services, and the labor of individual members. Outputs include effective demand for goods and services, offers of labor or management effort, savings for investment, taxes, and other payments, births, rearing the young, satisfaction of some psychological needs, and activities of family members that are structured by their family assigned roles, as for example, as parents or as minor dependents.

Group

The informal group as a social institution is a variable form because of the wide variety of groups and the often transient character of the basis for their interactions. Examples include kinship groups, occupational associates, schoolmates, playmates, neighbors, friends, cruise passengers, and sports spectators and participants. There is no concern here with demographic groupings by age, sex, ethnic or racial extraction, or with more formal groups in organizations, such as political parties. They are covered elsewhere as separate institutions or variables. Inputs to a group include identification of the group purpose, the member, and any quantitative data on past activities of the group in question. Outputs are satisfaction of recreational needs, joint problem solving, acculturation of the young, influencing the attitudes of individuals, satisfying psychological needs, joint or cooperative economic efforts.

School

Concern here is with education from the preschool to postdoctoral stages, whether publicly or privately provided, as well as the educational services of libraries, trade schools, apprenticeship programs, and similar formal and informal instruction. Inputs are educational materials, instructors, knowledge, procedures, and facilities. Outputs are trained graduates, knowledge, skills, dissemination of values and norms, and other components of socialization.

Church

Under the church, concern is with all formal and informal worship, religious observance, mystical contemplation, or other sources of religious experiences, as well as the social and welfare activities of organized churches and denominations. This concept of the church runs parallel to the concept of the school and complements it as a specialized educational force. Inputs are members, believers, church officials, lay leaders, teachers, choir members, fund raisers, facilities, and religious materials. Outputs are group solidarity, moral constraints, influences on values and norms, satisfaction of psychological needs for faith, reassurance, and social activities.

Association

The association includes all organized groups having some established purpose of a general sociocultural nature. Organized pressure groups are classified as political institutions under Item 10 in Table 9, but all associations can to some extent or at some time become lobbying or pressure groups. As a social group, associations have as inputs: individuals as members, guests, and officers, and the facilities and materials essential to the activity pursued, be it discussion, art, theater, sport motorcycles, or whatever. They have outputs in the form of recreational services, satisfaction of psychological needs, economic activities such as cooperative buying or selling, and communications and interactions with other associations and with informal groups.

Community

The community refers to the immediate sociocultural environment of the household, and not necessarily with the whole municipality or with the political aspects of local government. The community here can be a block, neighborhood or tract, or an extended rural area. As a social system, it accepts, weighs, or averages attitudes and exerts social pressures to enforce compliance with established norms. Its inputs are attitudes and community membership. Its outputs are norms and pressures discouraging deviation from the norms, as well as some material support to individuals and households in special need. The internal relationships are among individual or group attitudes, values, and the stringency of the sanctions applied.

Input and Output Variables of the Sociocultural System

Table 10 collects input, output, and feedback variables for each institution of the sociocultural class, and identifies the origin of each input and the destination of each output.

Table 10
TYPES OF INPUT AND OUTPUT VARIABLES
FOR INSTITUTIONS OF THE SOCIOCULTURAL SYSTEM

Type of Variable	Input to	Output from
1. Biological needs	Family, economic system	Individual
2. Biological satisfactions	Individual	Family, economic system
3. Psychological needs	All social institutions	Individual
4. Psychological satisfactions	Individual	All social institutions
5. Social pressures	Individual	All social institutions
6. Rights	Individual and formal institutions*	Political system
7. BAVOs	All institutions	Individual
8. Norms	Individual	All institutions
9. Conventions	All institutions	All institutions
10. Communication needs	Language	All institutions
11. Communication links	All institutions	Language
12. Knowledge, special material†	Church, social, group, association	Sociocultural system
13. Services, time, effort	All institutions	Individual
14. Expressions of intent, desire	Language	All institutions
15. Acculturation and socialization	Individual	All institutions
16. Fruits of cooperation	Individual	Social institutions
17. Trained individuals	All institutions	Schools
18. Savings	Economic system	Individuals, formal institutions
19. Facilities	All formal institutions	Economic system
20. Income	All formal institutions	Economic system
21. Purchases	Economic system	All formal institutions
22. Demand	Economic system	All formal institutions
23. Offers of services	All institutions	Individuals
24. Payments	All formal institutions	All formal institutions
25. Group identification	Groups	Total system
26. Responsibilities	Individual	All institutions

* Formal institutions include individuals, families, associations, parties, corporations, governments, and other entities having legal quasi-person status.

† Special materials include educational and religious material, and equipment for recreational and other activities of associations.

Note that most of the variables of the sociocultural system listed in Table 10 are inputs or outputs to or from the individual. This, of course, reflects the fact that the individual is the mechanism through which the forces that determine cultural evolution must operate and the link through which the heritage of the past is transmitted to the future. The material output of the economy ultimately serves the individual, either directly or indirectly by supporting the institutions to which he belongs. The institutional controls over the total system ultimately derive from the consensus of individual attitudes, either directly or more frequently through participation in political, social, and economic organizations or groups. The attitudes themselves are derived from the belief system inherited from the culture through the experiences of early infancy, the subsequent processes of acculturation, and the emotional responses and thought processes of the individual himself.

Characterization of the individual attitudinal system is difficult. Since these systems seem to be infinitely complex, obtaining an exhaustive set of attitudes or beliefs is not practicable and may be even theoretically impossible. Proof of completeness by logical means is also impossible. Reasonable or practical completeness can be achievable only after extensive experimentation and can be ensured only by empirical tests. Neither consistency of attitudes at one time nor stability of attitudes over a period of time can be expected. Group attitudes may be more consistent and stable, and they may be predictable from known characteristics of a demographic group.

Relationships between the Individual and the Sociocultural System

Most of the institutions discussed here involve people as active elements. They include the family, the informal group, the church, the school, the community, the association, the pressure group, the political party, the government, and various economic organizations. Demographic groupings are significant, but primarily as devices for classifying individuals into more homogeneous categories. Culture evolves primarily through the mechanism of direct interactions between individuals and these basic institutional groups.

Table 11 lists the major points of interaction between the socio-cultural inputs and outputs for the individual in the form of a structural matrix. A "1" has been placed in the cells of this matrix, wherever there is an important interaction between the inputs listed vertically and the outputs listed horizontally.

If the block of intangible social variables, such as the BAVOs, norms, conventions, and communication links, are eliminated from the matrix, the 1's are very sparsely distributed. This is because political and more particularly economic inputs to the individual are important to complete the picture. Examination of the nature of the indicated relationships is instructive, however. Among the inputs are things satisfying biological needs, all of which come either from the environment (such as

Table II
STRUCTURAL MATRIX OF SOCIOCULTURAL RELATIONSHIPS BETWEEN
INPUTS AND OUTPUTS FOR THE INDIVIDUAL

Inputs		Outputs													
		Biological needs													
		Psychological needs							Sociocultural needs						
		Needs	Wants	Desires	Satisfactions	Acculturations	Time, effort	Services	Needs	Wants	Desires	Satisfactions	Acculturations	Time, effort	Services
Things bringing biological satisfaction	1														
Things bringing psychological satisfaction	1	1													
Social pressures	1	1	1												
Rights	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
BATO	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Norms	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Conventions	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Communication links	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Services, time, effort		1	1	1	1	1	1	1	1	1	1	1	1	1	1
Acculturation		1	1	1	1	1	1	1	1	1	1	1	1	1	1
Cooperative services			1	1	1	1	1	1	1	1	1	1	1	1	1
Training			1	1	1	1	1	1	1	1	1	1	1	1	1
Offers of services				1	1	1	1	1	1	1	1	1	1	1	1
Responsibilities					1	1	1	1	1	1	1	1	1	1	1
Payments						1	1	1	1	1	1	1	1	1	1

Note: The figure "1" in a cell indicates a relationship between an input and an output.

air and sunlight) or from the economic system, and things satisfying psychological needs, which are derived primarily from material goods or from interrelations with other people or with groups. These reduce some biological and psychological needs of the individual and probably increase others. The satisfaction derived from these inputs are an important part of the psychological stimulus-response (gestalt, subliminal, or other) experience of the individual over his whole lifetime, but particularly during his early infancy. They are therefore extremely important in shaping his BAVO position. Social pressures exerted through interpersonal or group reactions play a similar role. A major problem in measuring a quantitative relationship is the problem of measuring the BAVO, the social and psychological variables discussed above. The study returns to them later.

The next input, rights, is the first example of a possible bundle of discrete variables that might be visualized as coding answers to such specific interrogations as:

	<u>Answer</u>	<u>Value of Variable</u>
1. In what state does Jane Doe reside?	State No. 13	13
2. What is Jane Doe's age?	19	19
3. Is Jane Doe already married?	No	0
4. What is the minimum age consent in that state?	18	18
5. Is Jane Doe legally able to marry?	Yes	1

Services, time, and effort, which may be either voluntary or for a price, can create responsibilities, offers of reciprocal services, or cash payments, influence attitudes, and produce both psychological needs and satisfaction. Acculturation influences psychological needs and attitudes, while training brings psychological satisfaction, knowledge, offers of service, demands time and effort, requires payment, and creates responsibilities. Cooperative services refers to the services of associations in cooperative purchase of goods or services or in cooperative offering of individual services or immediate homebased products. Offers of services from others demand payments or reciprocal services. Responsibilities influence attitudes, require the individual to save for the future, to purchase for others, thereby creating economic demand, to offer services, and make payments in accordance with the terms of contract. Payments permit savings, purchases, and other forms of outgoing payments.

Methodological Problems

This attempt to relate the inputs and outputs listed is not very satisfactory. As the first step in the system description, it clearly

needs some revision in the many tacit concepts discussed. The matrix is presented at this point to show some of the difficulties of the approach being developed. The matrix will be considered again in Chapter VII, where all the inter- and intra-institutional relations are assembled in one place, and all inputs or outputs to an individual (cultural, political, and economic) are also collected. Other major difficulties that have disturbed the identification of variables and relationships are considered at this point. These must be at least partially cleared up before systems analysis can be employed to help measure total vulnerability. Several perplexing difficulties are:

1. The state of the system tends to be described in terms of an almost endless list of states of discrete variables that identify the system as possessing or lacking each of a correspondingly long sequence of characteristics.
2. The forces that produce changes in state do so through pressures on individuals, preparing them to accept the changes, pressures on institutions leading to adaptations or changes in their state and positive inducements to social and cultural leaders to suggest, advocate, and even promote the changes.
3. The continuous variables in the system relate to the fraction of the population holding to specified tenets of the belief system, the strength of each individual's particular beliefs, the position of his attitude structure along appropriate scales between extremes, and the probability of changing beliefs through modification of the beliefs of others, modification of the political or economic environment, or through education, acculturation, or cultural diffusion.
4. Beliefs and attitudes are simultaneously overlapping and conflicting. A major problem is identifying a set of basic tenets in terms of which of the attitudinal position and value system of each individual could be located.
5. Many of the variables are intangibles and seem to come from different levels of abstraction.
6. Some of the variables mean one thing as inputs and something else as outputs, others are inputs to one individual and outputs to others.
7. Even if the meaning of these variables could be clarified and ways found to measure them, there would be no assurance that all of them had been found, or at least all classes of variables had been found.
8. Even if the mathematical relationships among sets of inputs and sets of outputs, could be found, there would be no assurance that the workings of the "individual" had been described.

9. Even if the description of the individual could be refined and supplemented to meet all these points of dissatisfaction, there would still be the problem of relating this description to the direct effects of an attack and projecting the description to the postattack environment.

No attempt has been made to solve these problems separately, since the comment that appears appropriate relates to all of them and goes back to the concept of systems and their analysis. In the first place, systems analysis does not explain things but merely describes the organization of their major parts. Analysis can be refined, if need be, to include subanalysis of these parts or subsystems into their parts. The detail of description is increased as the process of subdivision continues, but the stopping points are at the convenience of the analyst. The amount of detail can be great in some areas and sparse in others. At the end of the analysis, there is left a finite number of components (often called black boxes) that are described only in terms of their inputs, their outputs, and the appropriate relations identified among these. The system is then described in terms of the relations between the inputs and the outputs of each black box and the interconnections between them.

This description of the total system stops with 25 classes of subsystems. The subsystems used correspond to the distinctive institutions listed in Table 9, with the political man and the economic man included with the individual, reducing the 27 institutions to 25.

Because there are so many individuals, families, and corporations, there would probably be 200 million black boxes, including 180 million for individuals. These would be by no means identical. Each, in fact, would probably be uniquely identifiable in terms of a surprisingly small number of characteristics. About 113 million, for example, live in SMSAs and 67 million do not. Subdivided by age, sex, marital status, and place of residence, the largest class would probably be from New York City and would certainly number less than a million. Similarly, businesses, industries, corporations and governments could be classified.

Inputs to many institutions are outputs from individuals, families, or other heavily replicated entities. These inputs often do not refer to all the outputs individually but to averages, totals, or other results of arithmetic or mathematical processing of individual outputs, or aggregates of outputs processed over classes of individuals or other units. Some clarification will later develop in the discussion of mathematical relationships. Just as the ultimate models can be simplified by classification of individuals into more homogeneous groupings, other variables can be further classified into types. This is essential for practical and logical reasons, since, as already indicated, the number of variables of certain types (such as the RAVOs) may be truly infinite. Similarly, some of the relationships can be classified.

The relationships themselves, even aside from any similarities or homogeneity by types, may be of several different kinds, as indicated in the following comments:

1. One output may mathematically depend on one or more inputs.
2. One output may be correlated statistically with one or more inputs. Generally, this would imply that the output also depends (but not significantly) on at least one and more probably on a large number of neglected or unidentified variables.
3. A number of outputs may be determined jointly from some number of inputs by solving an appropriate number of equations derived from a system of simultaneous relations.
4. Although the interior of the black box is generally unknown for this systems analysis, it may be that certain intermediate or internal variables are necessary to identify relations between inputs and outputs. This is particularly true if inputs serve as increments to a cumulating variable, as receipts and shipments serve an inventory position.
5. Inputs must not be identified with causal or independent variables and outputs must not be identified with dependent variables or effects, since orders, for example, can draw outputs from one industry to meet required inputs to another one. An input may be determined by one or more outputs or correlated with them.
6. Some of the variables may serve merely to control the direction of flow, as for example in using an income criterion for qualifying for relief payments. In this case, the relationship either involves inequalities rather than equations or discontinuous functions of stepwise character.

The completeness of the identifications of variables and even of black boxes cannot be determined from the systems description, since the elements identified depend on an understanding of the real system described. The structure of a systems description and its patterns and symmetries can bring to mind variables otherwise forgotten, and this is one of the contributions systems analysis can make. The process of verifying that all outputs are inputs to something in the system or to its external environments and that all inputs come from the environment or some part of the system can at least fill in gaps that might otherwise occur.

This application of systems analysis and the models to be derived from it to the assessment of total vulnerability has been pursued to permit systematic consideration of the indirect effects of an attack. Many of the variables and many of the black boxes cited would be directly affected by an attack. With the help of models yet to be developed, many indirect effects could be identified. Variables that are not affected directly or indirectly could be suppressed from the description.

A practical consequence of this observation would result from applying it to a BAVO group of still unspecified variables. The attitudinal

variables of interest are only those directly or indirectly affected by an attack in such directions and to such extents as to affect the functions of the black boxes significantly. Without a definitive list of significant BAVOs, it would suffice for a prototype model to start with tangible or other known effects of an attack and to look for BAVOs related to the more demonstrable effects associated with them, or suggested by them. This course is followed later to identify some of the potentially important attitudinal factors warranting attention.

Table 1, listing some of the effects of massive attack, included as Item 8 among the so-called primary effects the probable "disruption of familiar social relationships, values and norms." The following list indicates some values typical of U.S. modal groups. These values, presumably products of the underlying belief system as it has interacted with the changing political, social, and economic structure, are for the most part often stated positions having something of the nature of national ideals, or they are part of a national stereotype. Appendix A describes in further detail some of the problems encountered in measuring attitudes and suggests some possible approaches.

Sociocultural

1. Underlying philosophy is pragmatic, operational, scientifically objective, tolerant, achievement oriented, dedicated to the principle of equal opportunity in self development, individualistic within bounds but requiring external social conformity.
2. Religious patterns are monotheistic but otherwise eclectic demanding only belief in existence, God or man, with cultural pressures for church membership, for separation of church and state, and for secular and social orientation of religious activity.
3. Moral patterns are dominated by a slowly relaxing puritanism respecting right to privacy but condemning irresponsibility.
4. Family is nuclear, with male responsible for household and with sex confined to monogamous marriage.
5. Mores emphasize cleanliness, humanitarian activities and concerns, and universal education.
6. Faiths include belief in progress tempered with growing scepticism, general acceptance of the desirability and inevitability of change, general reliance on expertise, and the desirability of technological advancement.

Political

7. Prevailing political philosophy is liberal conditioned by a general fear of power concentrated in either the hands of groups,

economic interests, or government, leading to a faith in a system of balances among the agencies of government, and among the pressure groups.

8. International biases are towards a reluctant interventionism with a weakening nationalistic flavor.
9. Individuals have a responsibility to vote, to exhibit patriotic sentiments, to accept fairly allotted share of military service, jury duty, and like public service.
10. Legal philosophy is based on presumed self interest or family interest and presumption of innocence until invalidated by proof of guilt.
11. Highly venerated rights are freedom of movement, occupation, privacy, thought and (within culture) speech with equality under the law.
12. The sanctity of contracts and sworn word is strongly defended.

Economic

13. The economic system is based on free enterprise regulated only in manifest public interest, with opportunity for all to accumulate and dispose of wealth.
14. The duty to work is universal for all male adults and for unmarried females.
15. The social structure is idealized as an open-class system with upward mobility sanctioned and encouraged, with occupational and business success highly regarded, and material comforts and conspicuous consumption accepted as goals and symbols of achievement.
16. The rights of private property are maintained but monopoly is feared and opposed.
17. Benefits flowing from public enterprises are to be shared by all, except as modified by selective incidence of taxation (highways supported by gasoline taxes) or by need.

Attitude studies and adequate empirical data would bring the study to a point where group attitudes could at least be described and relationships between them and the state of the general environment could be indicated. How would the changes in attitude associated with the attack and its aftermath influence values or norms, social institutions, and the organization of political and economic life? To predict the effects on social, economic, and political organizations, it would be necessary to identify the values, norms, and institutions that are significant for

particular organizations, to relate the support for alternative organizations to such values, norms, or institutions, and to relate the socio-cultural system to the other systems it conditions. Some approaches to this problem are discussed in Appendix A, which also includes further details about some of the problems encountered in measuring attitudes and suggestions of possible approaches.

Qualitative Model of the Individual in a Postattack Society

Pressures on an individual tending to modify his belief structure could include changes in the whole economy (particularly the phase of the business cycle), changes in his relative economic status, additional education, aging, changes in the world political situation, changes in the local or national political situation, changes in the beliefs of his family or associates, changes in his choice of associates or other events changing his associations (for example, in case he moved), events leading to a change of religion (for example, because of marriage), increased or continuing influence of others, of advertising, editorials, commercial or political propaganda, or the course of political debate, his own thinking, and his responses to associations of events, whether rationally based or not.

To approach the perhaps impossible task of anticipating the changes that could be generated by a nuclear attack, the major environmental pressures on the individual in society must somehow be identified, the pressures most affected by the attack must be discovered, and some insights to the nature, force, and direction of these effects and some hypotheses as to the manner in which these effects will be reflected in changes in cultural pressures and norms must be derived from the best available theory.

The pressures on an individual must be viewed in a dynamic setting extending over his life span, beginning with infancy and the first effects of socialization generated through family and peer group pressures; the effects of education and more significantly the interactions with others involved in the education process, siblings and family members, playmates, schoolmates, teachers, neighbors, and strangers; then the effects of occupational associations and other involvements in adult roles; family formation and the roles and interactions relative to it; and finally the group memberships, associations, and combinations through which he influences society and its culture and by which his discretionary interests and activities are channelled into significant commitments to action.

The model of the individual proposed here could either be regarded as phases of the life line or development of one individual, or as a model of pressures on all individuals classified by age group. To simplify, the age spans can be divided into a few characteristic intervals as follows:

<u>Age</u>	<u>Phase</u>
0-1 year	Early infancy
1-5 years	Infancy
5-18 years	Formal education
18-23 years	Higher education, military service, taking up an occupation
23-35 years	Family formation
35-65 years	Normal adult
over 65 years	Retirement

Consider first the period of infancy postattack. Crowded living conditions will make privacy less accepted and expected. Something of the quality of extended kinship groups will return. In many areas classes of preschool children will intermix. In so far as early acculturation differs between urban and suburban living and between middle and lower class cultures, the effects of these factors may make for shifts toward urban, lower class values and behaviors independently of shifts in status as such.

Loss of facilities and staff and the increased distractions of living in privation will lower the quality and effectiveness of the educational system and may shorten the average number of years completed. It should reduce interest in the abstract and aesthetic and increase interest in the practical. Radio and TV will still be important in young lives, but such organized recreational activities as Scouting and Little League baseball will probably be curtailed. The effects on individualism, patriotism, and other general qualities of the culture, however, may depend on the extent to which children are called on to assist with rubble clearance and other community undertakings. Family support of college age students may present increasing difficulties unless replaced by liberal federal fellowship programs. The limited capacity of surviving schools may set high standards for entrance and for scholarships. Higher education could thus prove more selective, widening the gap between the high-school graduate and the college man.

Selective service, if retained at all, may develop into Job Corps activities and other nonmilitary forms, and become less homogenizing. The relative roles of girls and boys may change. Reduced need for housework and clerical activity in the crowded but commercially simpler post-attack life may shift emphasis to more active occupations. The mores of Israel in the 1950s or postwar Germany or Italy may provide hints of possible changes here. If laws against employment discrimination on the basis of race, religion, or sex are retained, trends toward reduction in the differences in sex and class roles may continue or be accelerated.

The forces affecting family formation traditionally include such factors as job security and income of the potential husband, the sex

ratio in marriageable age groups, the nature and extent of opportunities for heterosexual participation in occupational, recreational, cultural, or other groups and associations, and the availability of housing.

Cycles in attitudes could also be influential. The frantic mores of the Twenties may have added to the apathy of the Depression Generation, which may have accentuated the spirit of involvement of the Forties, which may have reinforced the fatalism, serious-minded ego-centrism, and togetherness of the Fifties, which may be enhancing the cool rebellion from middle-class values that typify the going-steady teenagers of the kookier Sixties. Such patterns of reaction and counterreaction are difficult to identify or verify, and impressions are notoriously untrustworthy, but there may be some cyclic tendencies symptomatic of a negative cultural feedback. Such cycles could particularly affect attitudes toward family formation and family life and thus affect the age of marriage, marriage and fertility rates, divorce rates, prevalence and severity of marital conflict, and family solidarity. Postattack shortages, immobilities, constrictions, and economic insecurity--when superimposed on normal trends and cycles--could shake even the nuclear family. The relatively high cost of wealth, as compared to the cost of sustenance, may increase the number of working wives and weaken one of the traditional factors supporting stable marriages. Government policies toward employment, social security, housing, and family problems proper could be very important factors.

Individuals in the stable adult-age span will be subject to the greatest shock and will be at the age least likely to be adaptable. Many in this group will have lost their savings, homes, members of their family, and even their occupations. Structural unemployment, downgrading of workers, and virtual elimination of certain types of businesses, industries, and services will force many adults to seek new occupations that may require training and will cost them the usual benefits of seniority. Faced with poor living conditions and loss of status, many in this group will find themselves buffeted by family and marital discord, dependent on their wives for necessary supplements to family income, and deprived of time and privacy for working out conflicts or opportunities for turning to hobbies or other diversions. Family planning will be complicated in every respect and the role of the head of the household will involve increased divergence between responsibilities felt and the authority or capacity to meet them. Floating anxieties from this situation may accentuate recourse to scapegoating and susceptibility to demagoguery.

Older and retired people may be less affected by changes in their lot, although scarcity of medical supplies could be important to them. These persons should be less disturbed by the general immobility and may even welcome the crowding, the forced companionship, and the closer ties with their peers, kinfolk, and children. With TV, radio, and both daily and periodical literature available almost as normal, many of the preferred recreations of the aged will be adequately available.

The psychological and social effects of the attack on the preschool and postattack generation may be most fundamental but the impact of any

changes would not be significant for the culture of the first postattack decade. The juvenile, teenage, and young adult groups are probably most adaptable and may be least disturbed. If a lack of opportunity for college and senior high-school education develops and selective or other compulsory service does not survive, the upper line of demarcation of this group may drift downward as younger adults enter the labor market. This shift could have repercussions later as occupational commitments dictated by circumstances during the early postattack period prove less well advised in the longer run after general recovery. Competition with their seniors, however, could have more immediate effects, further aggravating their problems of adjustment. The present cult of youth, whether real or mythical, could be supplanted by an emergent dominance of the young adults that might persist for a decade.

It thus appears that the most immediate feedback of postattack changes to the culture would come from individuals in the normally most productive age groups. The pressures on these groups will have the most immediate political and economic effects and are most important for further study.

The nature and strengths of the BAVOs of the various groupings in this age span should receive primary emphasis. Some of them can perhaps be derived from sociological survey data already available and changes predicted from introspective efforts at projection into the postattack experience. Validation by comparison with data from disasters or periods of great change could be used for questioning and reexamining such flimsy evidence.

Qualitative Description of the Sociocultural System

Systems analysis of the 25 types of institutions and the models to follow are ultimately derived from general impressions of the nature and relationships of these subsystems. To indicate these impressions and suggest their origins, the institutions are described in more usual qualitative fashion, without the constraints of a more rigidly structured and quantifiable set of models. The possible effects of nuclear attack on these subsystems are also discussed.

Individual

The formation and influence of the BAVOs from the point of view of the individual have already been discussed. However, because of the central character of the individual among the other institutions, the qualitative description of the total system starts with Table 12, a list of individual's needs, roles, and activities.

The status of individuals determined by wealth, occupation, and family will be greatly disrupted by nuclear attack. The resultant social upheaval would greatly accelerate vertical movement. This will follow from the wide differences in the impact of the attack, inevitable

Table 12

THE INDIVIDUAL, HIS CHARACTERISTICS,
NEEDS, ROLES, GROUP ENVIRONMENT,
AND ACTIVITIES

Personal Characteristics	Needs	Roles	Groups or Collectivities		Environment	Activities
			In household	Household Trade or work		
Age	Food	In household			Address	Eating
Sex	Beverages	On job			Type of dwelling	Drinking
Marital state	Clothing	In organized group			Cost of dwelling	Sleeping
Height, weight, and other identifying characteristics	Transport	groups	Union		Renter or owner	Working
Health, chronic diseases	Shelter	In informal groups	Church		Car owner	Commuting
IQ	Services	Denomination			Income	Voting
	Appliances	Political party			Net worth	Worshipping
	Status	Educational level			Debts	Shopping
	Association	Income level			Major assets	Spending
	Education	Household income			Saving	
	Protection	level			Dressing	
	Regulation	Ethnic group			Keeping warm	
	Expression	Sport, recreational, or hobby group			Organizing	
		Other associations			Participating	
		Informal groups			Reacting to others	
					Influencing others	
					Reading	
					Studying	
					Hobbying	
					Relaxing	

uncertainties, and inequities and biases in loss compensation, but most significantly from the new rich that would arise among those most responsive to transient needs of the unsettled economy.

Household or Family

The basic family unit consists of only the parents and children. In-laws are outside the basic group and there is no support for the once traditional role of elders. The family unit is extremely mobile geographically, and adult children leave the household, with the result that there is little family continuity, particularly with passing generations. The family is not a work group, and it is gradually becoming less of a purchasing group as teenage and other characteristic buying groups become increasingly important and differentiated. The household remains, however, as the effective consumption unit particularly with respect to food and appliances. Physical facilities are designed for the household, the effective residence and social unit. Marriage is generally an equal partnership, with comparatively great freedom for children. Parental responsibility is still recognized in law, but parental authority is increasingly limited by the state. Legal and social pressures exist for continuation of the family. Although most people marry, selecting partners of their own choice, many marriages are unstable. In the postattack society even more than today, the family will be the social institution concerned with reproduction and the proper rearing of the young. Its stability may be even more precarious, however, since congested living conditions will provide new irritants, economic uncertainties and difficulties in economic adaptation will shake the accepted but possibly obsolete concept of the male as head of the household, and the chances of a family surviving intact are less than the chances for an individual survival and the number of broken families may be increased by desertion. Although crises in the past have tended to draw families closer together, this pattern may be more important for the larger families of earlier generations and the extended kinship relations now being lost to general mobility.

School

In the United States, the school system is controlled primarily by the states and by local governments or school districts within them. National influence is confined to specialized financial assistance, to the prevention of discrimination or inequality, to the protection of individual rights, and to the separation of church and state. There is no central national authority for curricula, organization, or methods. Formal education has now been largely removed from the family and from religious groups, although private schools, secular and denominational, do exist, particularly at college level. Education, however, is essentially free, public, universal, and compulsory usually through high school level. The organization of the schools is essentially democratic with school boards either elected or appointed by elective officials, both subject to influence from civic and PTA organizations and from local or national pressure groups.

Adult education is an important part of the public school system. Beyond high school, colleges and universities are partial repositories of a learned, scientific society. They contain research facilities, trained personnel, and most of the nation's largest libraries.

As a whole, the school system diffuses cultural values and norms, serves to Americanize the foreign born and first generation, and helps youth acquire the skills needed for occupational success in an extremely complex and rapidly changing technological society. Emphasis on competitive success, although now less marked in the school system, has traditionally prepared youth for psychological adaptation to a competitive economy.

Postattack shortages of facilities, teachers, books, and proper equipment will hamper the schools. Migration and local concentration of refugees will contribute to loss of continuity and classroom crowding, as well as to intergroup tensions. These factors and possible pressures for labor may reduce attendance and lower the level of educational attainment as well as the scientific and academic content of curricula. Probable pressures for increased vocational training and concern with specific postattack problems will later be felt as a lack of technical skills needed for a progressive economy and society.

Language

The mass media--newspapers, periodicals, radio, and TV--provide an important supplement to the educational system and can be considered either a part of it or a part of the broader aspects of transmission, dissemination, diffusion, organization, synthesis, retrieval, and processing of information that has been grouped under language. These media will survive the attack and although suffering some loss of quality and volume of output, may gain in attention and thus influence.

Other aspects of language include opportunities for person-to-person communication, group interactions, town meetings and community planning, the activities of brokers and intermediaries of every description, advertising billboards and placards, traffic lights, warnings and other public signs and control symbols, as well as the memories of surviving individuals and the cultural heritage recorded in the surviving libraries, museums, data banks, official records, and archives.

Closer living, greater individual interdependence, and increased community activity will increase the importance of interpersonal communication, but reduced mobility will contribute to increased provincialism countered only by the national mass media. Fixed location public warnings will primarily provide ironic memories of preattack concerns and by their obsolete or inappropriate messages will reduce the influence of public signs generally. The concentration of the largest libraries in SMSAs will lead to the loss of many rare documents and much of the total of specialized technical, scientific, and scholarly literature. A major need will be the collection and duplication of surviving materials. The

most immediate and practical consequence of an attack, however, will be the loss of know-how and know-where of those surviving, and the disruption of once accepted arrangements for ordering, expediting, marketing, locating needed materials for products, and for arranging such actions. Restoring this network or developing one to replace it will create a major and persistent load on the capacity of the surviving telephone and mail systems.

Church

The churches continue to perform the majority of the rites of marriage and death, to serve as a source of primary contacts for individuals through their social and recreational activities and as social action agencies. Distinctive aspects of the church in the United States are its separation from the state, the absence of any important antireligious or anticlerical movement, the lack of political activity by the church (although not of political influence), the number and variety of religions, denominations, and sects coexisting in relative peace, and the extent of local autonomy, decentralization, and democratic control. In the postattack period, the churches may become active channels of help and welfare, and their surviving facilities are likely to be used as temporary shelters for refugees and the homeless. Most U.S. churches have traditionally been consonant with the social order and provided sanctity and legitimacy to diverse social practices and structures. Pressures will be applied to adapt churches to the postattack situations and to provide answers for questions and needs arising from it. Religious bodies tend to lag rather than lead social change. If they do so in the postattack period, new religions will arise to challenge the established ones. Newly created religions have usually opposed the social order, but they have also tended to withdraw from it with strong emotional and otherworldly orientation at inception. They may thus serve to divert dissatisfaction away from direct attack on the controlling centers of the secular order. It is likely that there will be postattack intensification of religious feelings and religious activities, but that it will be accompanied by changes in values and emphasis. The church will continue to serve as a stabilizing influence perpetuating religious and societal values and norms with increased appeal derived from its traditional role as a source of solace, personal strength, and emotional support in times of stress.

Community

Even as late as the turn of the century, the community, as the term is used here, tended to approximate the local political community--the whole town. Urbanization gradually led to a more highly differentiated neighborhood within the towns and cities that took over most aspects of unorganized community interactions. Although the differentiation into neighborhoods has persisted even in the growth of the large metropolises, activities related to the neighborhood have decreased and the influence of the neighborhood has changed more in its effects on the status of individuals living in it than as a cohesive social force. With the move

to the suburbs, the importance of neighborhood groups and neighborhood activities increased again, although a turning point may have again been reached with a swing back to apartment living both in the central cities and in the suburbs. The postattack situation will suddenly force individual families into closer interaction with neighbors and into community concerns, but it may introduce a community of strangers within the community of former residents. This two-community structure proved troublesome in the mass evacuation of European cities during and after World War II and it may present critical postattack problems.

Association

An attack would partially alter the present situation in which informal groups arise primarily in connection with an individual's activities and interests (his occupation, hobbies, recreation, and religious or cultural affiliations) rather than the circumstance of his residence. The lessened mobility likely will emphasize the relative importance of school and occupational group interactions as well as community or neighborhood interactions at the expense of more casual, more transient or less geographically concentrated group activities. This could have significant effects on psychological needs and frustrations and on BAVO development. The increased concentration of social pressure may simultaneously increase conformity of the modal groups and increase the urge to deviant behavior or rebellion. These effects are more likely to be felt by the individual than the family but, by increasing tension and conflict, will quickly be translated into additional instability to the family. The countervailing constriction of immobility may reduce the likelihood of breakup but increase the violence of eruptions.

Many preattack associations will lose their relevance or appeal, and national associations will lose control over local chapters and lose influence to other local associations. New or surviving associations will continue to offer a stabilizing influence to the U.S. social system, offering a source of primary contacts and social outlets for individuals in a disturbed environment just as they once did for a highly mobile society. They will continue to serve as adjuncts to welfare service activities and as pressure groups within the political system. Since de Tocqueville's visits, the United States has been notable for the variety, proliferation, size, and influence of private associations. Currently, the associations are highly organized and formalized with their greatest strength and concentration in urban areas. This urbanized and formal character will be greatly reduced in the postattack period, and emerging organizations will be predominantly regional or local. This increased localization will reduce the nationwide effectiveness of emergent extremist groups, but may make it easier for them to achieve local dominance. Traditional groupings by interest into such categories as agriculture, trade, science, technology, education, culture, fraternal, ethnic, racial, religious, health, social welfare, public affairs, patriotic, government, and public administration will still be relevant, but appeal will be increased for associations in social welfare, public affairs, and agriculture, and decreased for those in educational, cultural, fraternal, ethnic, and scientific pursuits.

The associations people now belong to vary with the social class, with the lower classes tending to confine their activities to union or fraternal affiliations, the middle classes to civic, service, educational, and recreational affiliations, and the upper classes to prestige service or recreational organizations. In the postattack period, the increased emphasis on local associations may draw the lower classes into some organized community activities. The general austerity may weaken the appeal of prestige recreational organizations, and even recreational associations in general, as well as the prestige of scientific and cultural groups. The Red Cross and Salvation Army play almost traditional roles in disaster and will probably handle many emergency functions in the immediate postattack period. Other community service, civic, and welfare organizations will become increasingly important in the weeks that follow attack.

V DESCRIPTION OF THE POLITICAL SYSTEM

Political Institutions

Systems theory in political analysis, as in sociocultural analysis, is still in very elementary stages, and no quantitative data are available in the ready-made form of input, output, and feedback variables. This chapter thus tries to identify subsystems of the political system and their variables in a manner that appears to offer the most to planners in the analysis of a postattack society.

Political Man

Following the theoretical framework presented in the previous chapter on the sociocultural system (see Table 9), the lowest level subsystem of the political system is political man. The concern here is with the number of voters, who votes, the way individuals vote, and the pressures that come to bear on them. Inputs include variables of the immediate economic environment, including, for example, the availability of employment and income; the international situation, which determines support or lack of support from other nations; and the state of the U.S. political system and its ability to provide for needs of the public. Outputs determine mainly the type of political system under which the United States will continue to function. This means not only the ruling party and the elected official, but through representative influence, the laws under which the country is governed.

Pressure Group

The pressure group takes many forms. It can be a demonstration group, a labor union, a business or agricultural association, or an ethnic or racial group. Inputs are similar to those of the voter, as the voter himself is an input to the pressure group. Outputs are actions to influence legislation, judicial decisions, and executive policy, as well as individual voters.

Political Parties

Concern with the party system is with the number of parties, their organization, belief system, membership and location, and source of strength. Inputs include individual interests, needs, and beliefs, as well as the energy of party workers. The major outputs are the selection and campaigning for candidates, and agreement on major issues and platforms.

Legal System

The legal system transcends all levels of government and encompasses the Constitution and Bill of Rights, international agreements, all federal, state, and local legislation, the judicial process, the court system, and the penal system. Inputs to this system are the attitudes, beliefs, and values of the populace and various pressures from interest groups. Outputs include legislation, rights, judicial decisions, and social justice.

Levels of Government

Five levels of government are now considered, each of them carrying distinct responsibilities or functions. The five to be considered, each a separate entity with its peculiar inputs and outputs, are:

1. Municipal or township government
2. County government
3. Special districts
4. State governments
5. Federal government

Each level of government carries important responsibilities and can be expected to carry even larger burdens in the postattack era.

Municipality and Township. The concern here is with the numbers, locations, and various forms this level of government takes (such as city-manager, mayor, or commission), and the geographic areas they encompass. Major inputs are property taxes, manpower and facilities, and votes. Outputs include police and fire protection, education, monies and plans for highways, and health and welfare services.

County Government. The concern at this level is, again, with the number and location of these governments, the vulnerability of county seats, and the form this unit of government takes in different areas. Inputs, similar to those of municipal governments, also include property taxes, manpower and facilities, and votes. One major distinction is that counties, as opposed to municipal governments, receive more inputs from rural than urban areas and generate more outputs to rural than urban areas. In general, however, major outputs are public welfare, highways, education, and correction.

Special Districts. These governments are for the most part school districts, but they also include a number set up to protect and distribute the benefits of natural resources, such as water, plus some 3,000

organized for fire protection. The concern again is with numbers of locations. Inputs are somewhat similar to those for other levels of government, but outputs are narrowly confined to the special purpose of the district.

State and Federal Government. The federal government and the 50 states share sovereignty in the U.S. political system, by Constitutional law and precedent, state governments being reserved responsibilities not explicitly delegated to the federal government. In both the state and the federal governments, concern is with the executive, legislative, and judicial subsystems, including the regulatory agencies, as well as legislative power groups and committees. The concern is with the military establishment and its role in peacetime, wartime, and in a postnuclear attack environment.

Inputs include party representatives and issues, pressure-group activities, the Constitution, and the laws. Financial inputs at the state level consist mostly of sales taxes, some income taxes, and intergovernmental exchange monies. At the federal level, funds are derived mostly from income taxes, though excise taxes constitute another source of income.

Outputs of the state governments are, for the most part, statutes, funds, organization, and facilities related to education, building of highways, and health and welfare services. Outputs at the federal level are concerned more with defense and international relations, laws governing the economy, settling disputes between states, development and conservation of natural resources, and postal and veterans services.

Those then are the institutions identified with the U.S. political system, in this report. The choice of political institutions (subsystems) is admittedly somewhat arbitrary and uncertain. One satisfying criterion in the choice is that they are all inclusive and tend to represent equal levels of abstraction; that is, there would be no more redundancy than if "government," "local government," and "municipal government" were listed as three separate institutions. It might, for example, be equally defensible and logical to substitute "electoral system" for "party" and perhaps omit "pressure groups," assuming that they are merely one form of "association," an institution of the sociocultural system. There may be no need to think of the municipality, county, special district, and the state as separate institutions. They could be grouped as one system--state and local--or, the local systems could be included as subsystems of the state system.

Input and Output Variables of the Political System

Table 13 lists some input, output, and feedback variables for institutions of the U.S. political system, identifying the origin of each input and the destination of each output.

Table 13
TYPES OF INPUT AND OUTPUT VARIABLES FOR INSTITUTIONS
OF THE POLITICAL SYSTEM

Type of Variable	Input to	Output from
1. Income	Political man	Economic system
2. Wealth	Political man	Economic system
3. Employment	Political man	Economic system
4. Social class	Political man	School
5. Public opinion	Political man	Pressure groups, language (newspapers)
6. Race	Political man	
7. Ethnic group	Political man	Family
8. Occupation	Political man	Family
9. Industry group	Political man	Economic system
10. Level of education	Political man	School
11. Type of education	Political man	School
12. Church membership	Political man	Family
13. Ruling party	Federal and state governments	Political man
14. Party platforms	Federal government	Political party
15. Elected officials	All levels of government	Political man Political party
16. Strength of pressure groups	All levels of government	Individual
17. Active voters	Political party	Social class
18. Taxes	All levels of government	Economic system
19. Government services	Individual, community	All levels of government
20. Government manpower	All levels of government	Worker
21. Educational facilities	School	State, school district, municipality, church
22. Form (or type) of government	All levels of government	Political man
23. The organization of government	All levels of government	Pressure groups
24. Legislation	Individual, community	All levels of government
25. Urbanization	Political man	Economic system
26. Strength of the military	Cultural system	Federal
27. Government debt	Individual	All levels of government

Table 13 (concluded)

<u>Type of Variables</u>	<u>Input to</u>	<u>Output from</u>
28. Government expenditures	Industry, business, corporations	All levels of government
29. Crime	Cultural system	Community

Many of the methodological problems discussed in the previous chapter apply here, and there is no need to redefine them. Some of the variables, such as level of education, taxes, or government debt, can be measured, but such important inputs to the political system as legislation present more difficult problems. Legislation is both an input to the political system and an output of it, and it is also an input to the economic and the sociocultural systems. It overlaps other variables, such as organization and form of government, and to an extent determines them. There may always be some factors incapable of mathematical formulation, which simply have to be omitted from an analysis of the type attempted here. Some measurement may be possible, however, that would throw some light on the complete system. One possibility could be classifying laws and using discrete variables to describe them. One possible breakdown could follow the format used in this report; that is, according to laws that pertain to the individual, the family, business, the municipality, and so forth.

Since laws are similar to contingent chains for decisions in parlor games and computer programs, they might be described by interrogation routines that established to whom they applied, under what circumstances, and under what penalties. This could at least provide a method of approach for use in completing a thought description of the legal system. The same device might be extended to other aspects of the political system.

It remains true, however, that many variables of presumed relevance to the political system as a whole were missed in the systems analysis, just as they were in the description of the sociocultural system. These include counts of voters and other exemplars of political institutions, as well as variables relevant to the average state of a class or collection of such exemplars of type subsystems. Measurable factors include the number of laws pertaining to these various institutions, the crime rate relative to laws associated with each institution, and perhaps the manpower assigned to various parts of the legal system--traffic police, FBI, and so on. More of these are identified in Chapter VII.

Relationships between the Individual and the Political System

Table 14 lists the major interactions between political inputs and outputs for the individual. The same procedure is followed here as in Table 11; that is, "1" has been placed wherever there is an important interaction between any of the inputs listed vertically and any of the outputs listed horizontally.

Table 14
STRUCTURAL MATRIX SHOWING RELATIONSHIPS BETWEEN
INPUT AND OUTPUT VARIABLES FOR THE POLITICAL MAN

Inputs	Outputs						
	Ruling Party	Elected Officials	Organization of Government	Type (or form) of Government	Party Officials	Some State and Local Legislation	Some Control of State and Local Expenditure Candidates for Office
Income	1					1	
Wealth	1			1		1	
Employment					1		
Social class	1						1
Public opinion	1	1					
Race		1					1
Ethnic group		1					1
Occupation		1			1		
Industry group		1			1		
Level of education			1				
Type of education			1	1			
Church membership		1			1		
Urbanization	1						

Note: The figure "1" in a cell indicates a relationship between an input and an output.

As with the sociocultural system, there are few direct one-to-one relationships between inputs and outputs of the U.S. political system and the 1's in the accompanying table are debatable. For example, income, wealth, and the concomitant social class, together with an individual's level of education, the occupational, ethnic, or racial group, church, and whether he is from the city or the country (urbanization), all affect his vote. These inputs to political man not only determine his vote, but whether or not he will vote, and how active he will be in expressing his political opinions, in joining associations that pressure government officials for specialized legislation, and whether he will become active in the party organization itself, run for office, or take other political roles.

These outputs then affect (if not determine) the ruling party, the elected officials, legislation, government expenditures, and so on.

Methodological Problems

As previously indicated, there may be some advantage in using the concept of an electoral system as an institution. Votes and party activity could then be thought of as being among the outputs of political man and inputs to the electoral system, which in turn produces candidates, platforms, laws, and so on.

Votes, as variables, however, also present methodological problems in quantification. The number of votes cast in any election can be counted--how many voted Republican or Democratic or for other parties, and how many voted for and against nonpartisan candidates, and how many voted for and against particular legislation or expenditures. But research findings have not yet indicated some of the direct relationships. For example, it is not known if a man's income were halved, that he would vote to cut government expenditures by 50 percent. There is some indication from the Depression of the Thirties that a decrease in income is accompanied by an increase in government expenditures, but the point is, that this relationship is not quantitatively known.

To determine what directions the U.S. political system is taking, or takes under specific conditions, such as nuclear attack, there is a need to know what elected officials stand for or against, and to find some way of measuring these decisions and directions, and the conditions that caused these issues to be resolved the way they were.

For example, the Republican and Democratic parties today represent quite different platforms (covering some of the same issues) than they did, say, one hundred years ago. On local issues, the parties may take different stands in different parts of the country.

There is no attempt to resolve these questions at this point in the report. Further discussion is deferred to Chapter VII, where all the institutional relations are assembled in one place.

Qualitative Description of the Political System

Unfortunately, with the present state of the art, many changes in the institutions of government cannot be definitively measured; therefore, the institutions of the U.S. political system and the effect a nuclear war might have on them are described here in qualitative terms.

Political Man

The political activities of the individual are usually as a voter (or non-voter); many are further involved either as candidates for office, as party workers, or as active members of pressure groups. A still larger number are involved in the processes of government, in civil service posts, as temporary or appointive officials or employees of the various agencies of government. Others earn their livelihood through dealing with government as lobbyists, lawyers, consultants, advisors, and as employees of companies working on government contracts. Others are employed in occupations or companies that provide support to such individuals, agencies, or companies.

Interactions of the individual with the many government agencies that affect him include his activities as a licensed driver, criminal, juror, litigant, taxpayer, serviceman or veteran, businessman (and thus as a tax collector), or applying for a building permit, scholarship, drivers license, car license, marriage license, birth or death certificate, or in registering deeds, loans, and property sales, and countless other benefits or burdens of organized government.

Pressure Group

The legally recognized influence of the individual on the government is exerted in his voting. This immediate influence is slight, however, compared with the influence he can exert by group action and by persistent expression of his opinions, grievances, complaints to legislators, and others in government. His influence through active participation in pressure groups is difficult to identify or to measure, but it is certainly important in the aggregate. Pressure groups are probably most effective in publicizing and drawing official attention to problems and in influencing legislation, but they also influence the executive forms of government, and even the judiciary. Their organization depends greatly on the nature of their campaign and whether the goals they seek are concerns of local, state, or federal government.

It is expected that a postattack society would be very disruptive to the present balance of pressure groups. With a major cities attack, the strength of such groups as labor unions would be diminished, or at least scattered. Mere survivors alone would dictate a stronger, more organized rural voice in government. A damage assessment on memberships of different pressure groups would give clues to the direction the surviving groups will take.

Political Party

The two-party system has tended to keep the parties somewhat alike in platform and action, with differences more in overall tendencies and patterns than in openly contrasted positions. Electoral rejection has discouraged either party from embracing extreme positions or very controversial candidates.

The two major parties absorb a great deal of the conflict and differences of interest and opinion that might otherwise more openly erupt and disrupt the U.S. social system. Third parties have played relatively minor roles, although they have changed the outcome of some elections and even won some at state and local levels. Except in the large SMSAs, party politics has been concerned more with state and national elections than with local elections, and some states, counties, and cities often elect local officials on a one-party or non-partisan basis.

The present balance of party power will probably be disrupted to some extent in the postattack period. It is likely, again with a heavy cities attack, that the balance of power could be reversed in some states, as in the Midwest, for example, where rural Republicans would have a greater survival rate than the more urbanized Democrats. Depending on the ability of existing parties to meet the pressing needs of the new environment, a third-party movement might arise.

Legal System

With legal system founded on the Constitution, common law, legal precedent, and specific legislation, and with the courts relatively protected from executive influence and from any legislative influence not expressed in Constitutionally sanctioned legislation, the judiciary constitutes the established safeguard against violation of due process and for the protection of civil rights and liberties.

It is conceivable that, although the Constitution and the laws would constrain the U.S. social and political system in a postattack era, they could again be abrogated as they were in Lincoln's day during the Civil War and more recently in the case of martial law in Hawaii and the relocation of Japanese from the West Coast in World War II.

Municipality and Township

There are some 25,000 municipal governments in the United States, all of them instrumentalities of the various states, functioning for the most part under either a mayor, commission, or council type of government, with varying degrees of effectiveness. There are also still a number of town and township governments in New England and the Midwest, supported mostly by property taxes and providing mainly police and fire protection, education, roads, and sanitation services.

An extremely heavy burden will be put on municipal governments in a postattack environment, particularly at first. Because a small percentage of municipalities have civil defense directors, EOCs, or adequate plans, it is likely that spontaneous leaders, groups, and organizations will emerge to cope with the disaster as best they can. In the long run, it is expected that the more inefficient types of municipal government will be abandoned for more efficient ones and that many elected officials will be replaced as soon as election machinery can be reconstituted because of their real or imagined inadequacies at the time of crisis.

County Government

The some 3,000 counties in the United States are rather loosely organized for the most part, and with varying responsibilities in different parts of the country. Counties are organized in a great variety of ways, but most have something like a county board which, in most cases, is elective. This level of government functions as a judicial unit of the state, and many times is a welfare arm of the state; but it is also involved in highways and education, and performs those services required by the unincorporated areas of the county.

Since only 50 county seats are located in cities of more than 500,000 population, a good many can be expected to be saved, even in a cities attack. But because county governments are generally more poorly organized than either cities or states and because most of them lack a chief executive, disruption at this level would probably be extreme.

Special District

There are some 35,000 school districts in the country and some 18,000 special districts set up for such purposes as fire protection, soil conservation, drainage, water, housing, sewerage, highways, parks, hospitals, libraries. Most of these districts are located within a county, but they seldom coincide with other political units. A good part of the revenue of school districts is from intergovernmental sources, about half coming from property taxes. Other districts usually do not depend on taxation for revenue.

Most special districts are located outside the SMSAs. About 30,000 school districts and 13,000 other special districts are outside these areas. Because of this, it is expected that as far as numbers of surviving units are concerned, special districts will fare much better than some other levels of government.

Reorganization of districts, reconstruction of poll lists, election precincts, and voting districts, construction of emergency housing, reconstitution of taxing authority and tax collection machinery would all affect the role of local government. Unless chaos is nearly universal and reorganization impossible except on the basis of each locality for itself, it

appears likely that state or the federal governments will gain in power and responsibility. Either case would accelerate trends toward administrative centralization.

State Government

To the state governments, of course, are reserved the powers not specifically delegated to the federal government. Every state has an elected governor, and all but one state have a bicameral legislature. The states receive most of their revenue from sales taxes, supplemented in some states by income taxes. Most state expenditures go for education, highways, and health and welfare.

As plans stand now, state governments are expected to carry a tremendous burden in the postattack period. Many have advanced and well organized plans for this period. Many do not. Thirteen of the 50 state capitols are located in cities of more than 500,000, and would probably be hit in a cities attack. Of these, three have no emergency operating center (EOC), and only four have EOCs that are blast protected. Many do not have detailed succession laws for an emergency--particularly in the case of the judiciary--and only a few have provisions for preserving records. Some still have not provided for relocating the state government in case of attack.

As with other levels of government, the extent to which the state is vulnerable to attack depends on how hard it is hit and the extent and effectiveness of its preattack planning. No damage assessments have yet been run on facilities, manpower, and other aspects of government. It appears that this would be rewarding.

Federal Government

One of the most important features of the federal government is that it is democratic, rather than totalitarian. Its system of checks and balances among the executive, legislative, and judicial branches and its civilian control over the military has prevented the concentration of political power in the hands of a few.

With appropriations under the control of Congress, the executive branch is limited by budgetary controls, as well as by other legislation and by judicial safeguards. It is expected that this situation will change in the postattack period, because of the general assumption of emergency powers by the executive branch at state and federal levels and because of pressures for emergency appropriations with minimal restrictions on their use. Moreover, with the welter of property actions (liquidations, bankruptcy proceedings, debt moratoria, condemnation proceedings, estate settlements, tax defaults, contract violations, and other civil litigation to clarify or establish ownership and authority) the dockets of the judiciary will be overloaded at all levels and due process slowed. The result will be a delay in the application of the safeguards provided by the legal

and judicial systems and confusion and uncertainty in their eventual resolution because of intervening administrative actions and the loss of evidence, witnesses, judges, and litigants. If loss equalization is based on court decisions, the situation will become hopelessly compounded, and if based on administrative evaluation subject to judicial review, they will become hopelessly uncertain and opportunistic. The power of the executive branch of government will grow tremendously even if recourse to martial law or military government is avoided.

The present balance between state and federal powers will probably change markedly one way or the other. If the country is seriously fragmented and the federal government incapable of reconstituting itself to the extent of exerting effective control over recovery efforts, the state governments will gain in relative power and national goals will tend to be partially forgotten in regional concerns with immediate survival. The precariousness of the postattack situation, on the other hand, and the additional sacrifices and effectiveness needed to exploit the potential capacity of the surviving economy would point up the need for nationwide planning and close federal control. If the federal government can exercise such control, state and local powers can yield to integrated central policy making and even to centralized scheduling of recovery efforts at the expense of states rights and local hegemony.

Although minor modification or adjustment of many of these features of the U.S. system would not nullify the basic political philosophy on which they were built, major changes in any of them would raise question regarding the survival of the system as a whole.

VI DESCRIPTION OF THE ECONOMIC SYSTEM

Economic Institutions

The economic system is described here in terms of a number of socio-economic institutions of broad scope interacting in different ways with quantitative economic variables that are both tangible and intangible. This institutional emphasis forces into clearer view some of the basic principles and conventions on which the economy is founded, relegating to the substrata of subsystems descriptions of activities directly responsible for the output of goods and services.

Economic Man

The individual is again a fundamental institution but primarily in his economic aspects. This is highlighted by referring to one facet of the individual--his role as a worker. As a worker, he considers alternative opportunities for employment or otherwise earning a livelihood, responding to differences in present or prospective future earnings, differences in training requirements or entrance costs, differences in working conditions, and similar advantages and disadvantages.

Inputs to the individual are first monetary wages or other monetary rewards in the form of income. Although his relation to the economy is overparticularized by the term worker, the individual must concern himself with the use of the income provided. His allocations of income among alternative expenditures, including savings and investments, are outputs and relate to his activities as a consumer. These allocations provide for an input flow of goods for immediate or future consumption, ownership of durable goods for extended service, and collection of titles to property held for income or speculation. The durable goods and the property while not feedback elements directly, provide for a recycle in the form of continuing future satisfactions and incomes. Because of income earned and property held, the individual must include among his allocations of income a portion for tax payments.

The household is not separated out as an economic institution, as might be appropriate, because of the increasingly individual character of so-called household expenditures and career activities. When the individual acts as head of a household and sole provider for dependents, necessary allowances for income allocations can be made by dependents as though some portion of the individual's gross income was immediately transferred to them, whether or not some regular allowance or budget allocation is actually in force.

In simple terms, the outputs of the economic individual are disbursements and services. The inputs to him are receipts and goods, services, and intangible assets.

Labor Union

The union is an institutionalized group with inputs in the form of union dues, income from accumulated union funds, and property used in union activities. Outputs are salaries paid union officials, payments to members from welfare funds and other benefit plans, and union services in collective bargaining for wage and working-condition contracts.

Business

The business is differentiated from industry to distinguish such activities as trade, finance, and service from activities producing tangible goods as in manufacturing and agriculture. Activities are generally classified as business if the costs of doing business are either predominantly salaries or purchases of already finished goods. Borderline activities, such as transportation, are classified with the industries. Inputs to a business are services of employees, flow of products for resale, and essential facilities. Outputs are flow of products sold, organized services rendered, and wages and other disbursements covering costs of doing business. Receipts from operations are inputs. Investments of retained earnings and dividend disbursements are outputs.

Industry

Industry has a similar set of inputs and outputs, except that raw materials and semifinished products are important input flows and finished or semifinished products are output flows. The distribution of those output flows are largely to businesses or other industries, and the major material inputs, including durable equipment and facilities, come from industry.

Corporation

As with the union, the corporation can be associated with either industry or business. Industries, except agriculture, are generally in corporate hands, while businesses may not be. Interest in the corporation here is chiefly as an investment and management activity. As such, it disburses dividends, interest, and salaries as output, and it receives investment funds and clerical, management, professional, and other services as inputs. Investment funds can be placed in a business or industrial enterprise and used to operate that enterprise with the inputs and outputs characteristic of it.

Property

Under property, the concern is with land, mineral rights and other natural resources, equipment, housing, facilities, inventories, and consumer durables, as well as deeds or evidence of ownership of tangible and intangible assets. Inputs to property are construction and purchase. Outputs are rents, dividends, interest, royalties, and other services and income.

Markets

Markets here refer to stock and commodity futures markets and other arrangements for exchanging goods and titles that involve some element of negotiation or bargaining, masses of transactions, and a method of continuously establishing price. Retail trade is considered mostly under business. Inputs to markets are bids for titles and shares and offers to sell.

Contracts

Contracts form a control-type institution having conventional and legal status covering the terms of payment and repayment, delivery and performance. Inputs are a need to procure a good or service and a capacity and willingness to supply it. Outputs are terms of the transaction and legal bases for enforcing compliance.

Money and Credit

Money and credit constitutes an integrated system for effecting transactions and complying with the terms of contracts or avoiding the need for negotiating them. Outputs include installment loans, mortgages, banknotes, c.o.d. arrangements, hard currency, commercial paper, and bills receivable. Outputs include interest, income earned, and transport of funds in location and time.

Government

As economic institutions, governments are sources of currency, business and industrial regulation, adjudication of conflicting claims, and budgetary expenditures. They receive taxes and proceeds of bond issues sold to individuals, corporations and businesses as investments.

Input and Output Variables of the Economic System

Input and output variables of economic institutions are listed in Table 18, which shows the institution of origin for inputs and the destination of outputs. As with variables of the sociocultural system and the

Table 15
TYPES OF INPUT AND OUTPUT VARIABLES FOR
INSTITUTIONS OF THE ECONOMIC SYSTEM

<u>Type of Variable</u>	<u>Inputs to</u>	<u>Output from</u>
1. Consumables	Business, individuals	Industry, business
2. Services	Business, industry, government	Individuals, property
3. Facilities and equipment	Property	Industry
4. Semifinished products	Industry	Industry
5. New construction	Households, business, industry, government	Industry
6. Wages and salaries	Individual	Business, industry, government, corporations
7. Interest	Individuals, corporations, business, industry	Money and credit
8. Rent	Individuals, corporations, business, industry	Property
9. Royalties	Individuals, corporations, industry, business	Business, industry, government
10. Profit	Individuals, corporations, business	Corporations, business, industry
11. Dividends	Business, individuals	Corporation
12. Income	Individuals, corporations, business	Individuals, corporations
13. Taxes	Government	Individuals, industry, business
14. Proceeds of bond issues	Government, corporations	Individuals, corporations, business, industry
15. Expenditures	Corporations, business, industry	Individuals, government
16. Claim adjudication	Individuals, corporations, business, industry	Government
17. Dues	Unions	Individuals

Table 13 (concluded)

<u>Type of Variable</u>	<u>Inputs to</u>	<u>Output from</u>
18. Loans, mortgages, advances	Individuals, corporations, business industry	Money and credit
19. Savings and investments	Money and credit, corporations, business, industry, property	Individuals, corporations, business, industry
20. Bids	Markets	Individuals, business
21. Offers	Markets	Industry, corporations
22. Terms	Contracts	Government, individuals, industry, business
23. Compliance	Individuals, business, industry, corporations	Contracts, government
24. Needs	Business, industry, markets	Individuals

political system, many of the variables listed are inputs to and outputs from the individual. These will be collected and discussed in Chapter VII, which deals with relationships between subsystems.

In describing the economic system, the measurement of most of the variables is far less troublesome than sociocultural variables. Subjective problems remain primarily in connection with individual motivations underlying choice of occupation, consumer spending patterns, and related matters.

Together, business and industry account for most employment and all the flow of goods and services. The PARM model or the more aggregative STRENGTH model of National Resource Evaluation Center (NREC) provides considerable detail on the relationships among capability, material inputs, and normal outputs by industry group. Resource location data are available at NREC for use in assessing damage to describe the distribution and severity of losses from the direct effects of any particular attack. The PARM and STRENGTH models are useful in analyzing secondary consequences of an attack by tracing indirect effects and in testing the feasibility of stipulated schedules of recovery. These models allow for allocations of appropriate current output and construction activity to the conversion, repair, and generation of new facilities required for specified schedules of output. None of the models, however, provide for examination of effects of attack on prices and values or on most of the economic institutions of procedural type.

It is paradoxical but significant that the aspects of economic theory on which agreement is most general turn out to be related to areas for which definitive data are hardest to establish. The legal protection afforded property and the privacy of private property have made it extremely difficult to establish what the wealth of the nation really is and who owns how much of it.

Students of this question, such as Raymond Goldsmith, Simon Kuznets, and Daniel Creamer, have only approximated agreement on the aggregate amount of the national wealth. This is partly because large units of wealth are not valued by the open market and a fair value is not easily imputed to them. However, the difficulties associated with measurements of wealth are rather technical, and the differences between alternative scales of measurement are less important than in the semantically and conceptually confused situation surrounding many cultural variables.

Relationships between the Individual and the Economic System

Table 16 collects input and output variables for the individual economic man in the form of a structural matrix with "1's" showing the cells for which an input variable listed vertically is related to an output variable listed horizontally. Consumables are inputs to the individual meeting biological and other needs and accounting for a portion of his expenditures. Wages and salaries, interest received, rent received,

Table 16

STRUCTURAL MATRIX SHOWING RELATIONSHIPS BETWEEN
INPUT AND OUTPUT VARIABLES FOR THE ECONOMIC MAN

Inputs	Services of Bonds	Proceeds of Bonds	Interest	Union Dues	Sale of Goods	Rents	Assets	Capital	Rents Paid	Interest Paid	Loans to Others	Outputs
Consumables												
Wages and salaries	1											
Interest received		1										
Rent received			1									
Royalties				1								
Profit					1							
Dividends						1						
Income							1					
Claim adjudication								1				
Loans, mortgages, advances									1			
Compliance										1		

Note : The figure "1" in a cell indicates a relationship between input and an output.

royalties, profit and dividends are all monetary inputs that combine into income and are used to cover savings, rent paid, expenditures, interest paid, loans to others, and so forth. Loans made from others affect taxes, savings, assets held, wealth, and interest paid. Claim adjudication relates to suits and legal actions. Compliance refers to legal obligations in connection with contracts affecting services to be rendered, taxes to be paid, and similar obligations.

As in the counterparts of this table for the political man and the individual as a social institution, missing variables from these tables are required to complete the picture of the individual as a system. Among the intersystem relationships on a most microscopic scale, outputs from one individual can be inputs to others. Moreover, feedbacks occur in that income from one period relates to or covers expenditures for others.

Table 16 identifies such variables as compliance, bids, and terms. Of these, compliance refers to enforced performance in accordance with terms of a contract. This type of variable is frequently discrete and for most individuals concern union or installment-purchase contracts. The terms are those negotiated in the contract and frequently concern wage or interest rates, working conditions, installment amounts, repossession, and the like.

Bids are prices offered for items sold in the markets. Bids that are most significant in this connection are associated with auctions, person-to-person sales, and more formal exchanges for securities and commodity futures. This is because retail sales are consummated primarily on the basis of uniformly stated offer prices, with the buyer having only the option of refraining from purchase or postponing it when he is not satisfied with the asked price.

More detailed consideration of the measurement and interrelations of these variables, as well as those associated with the other economic institutions, will be deferred to Chapter VII. However, a more traditional qualitative description of the economic system and its major institutions indicates the sources of these variables and allows consideration of their relation to attack phenomena.

Qualitative Description of the Economic System

The economic system can be described qualitatively in nonsystems terms as a collection of facilities, people, activities, and arrangements drawing on natural resources and personal services to produce a flow of goods and services to individual consumers wherever they are.

Economic Man

Economic man has roles, not only as consumer, but as worker, rentier, manager, and entrepreneur. To some extent, his BAVOs affect the roles he

will play and how he will play them. But his roles--his occupation and industry--in turn, will affect his BAVOs.

As a worker, he first feels the attack through loss of wages while confined to shelter. This is relatively unimportant, since his expenditures are also suspended except for the normal payments on his fixed commitments. At the point of shelter emergence, it is expected that physical problems will overshadow his economic anxieties, which, however, must still be met eventually.

Because of the great disruption, many will find no jobs or factories to return to, and much retraining will be needed to fit the requirements of the postattack situation. A great amount of unemployment can also be expected until economic activity is reorganized. There will be many urgent tasks in community rehabilitation; for example, decontamination, debris clearance, improvising shelter, and repair of essential service facilities when possible.

Aside from the few skilled in supervising or performing these types of work, the contribution of most surviving workers will be as unskilled or semiskilled helpers, regardless of their preattack occupations. The normal economy attracts apprentices or students to prepare for undermanned occupations by wage or annual income differentials. Postattack labor requirements will be quite different from preattack requirements, but equitable wage differentials will be hard to set, and responses are expected to be slow, particularly if changes in relative wages are delayed by initial wage freezes.

As a consumer, the individual, either alone or in household decisions, purchases consumable goods and consumes durables to the extent his financial assets permit, whether based on income, savings, or credit. Post-attack consumers will probably have to rely almost entirely on disposable income until savings, bank deposits, and other normally liquid assets are unblocked and ownership clarified. The value system that normally relates demand for individual products to their prices will operate very imperfectly if most prices are fixed and many products rationed, nonexistent, or of little immediate use.

As a rentier, the individual normally invests savings to produce a future flow of income through rents, interest, or dividends. After attack, these incomes may disappear and the assets from which they were derived may be lost. As a landlord renting a surviving building, the individual will be limited by rent ceilings and may have difficulty with collections. As a holder of mortgages, stocks, or bonds, he may have difficulty establishing his ownership, if records are lost, or collecting interest and dividends from corporations as well as from private parties.

As an entrepreneur or manager of a commercial or industrial enterprise, the individual normally makes many decisions about pricing, production levels, product lines, marketing and distribution channels, and

other terms of doing business. These decisions will be greatly complicated by emergency regulations, by uncertainty regarding the financial status of the enterprise, by drastic reductions or uncertainties in markets, and by the loss of normal relations with intermediate business activities such as buyers, brokers, vendors, suppliers, and distributors.

Labor Union

The unions normally act as intermediaries between their membership and those that employ them. The union leadership engages not only in collective bargaining in wage contract negotiations but also in presenting individual and local grievances and in increasing the financial power and jurisdiction of their union. In the postattack period, the unions will be concerned with fair treatment and adequate placement of their members, in presenting any case for wage increases or adjustments to regulating authority as well as employers. Like the managers, they will be concerned with making some sense out of postattack economics to gain the most favorable status for their surviving members.

Business and Industry

Industry normally produces a flow of goods for sale by business to ultimate consumers. The goods offered in the markets number into the millions but can be grouped according to the types of processing involved. The most generally recognized basis for classification begins with the SIC system, which divides business and industry into nine major classes of activity, with approximately three times that number at the second or two-digit level, four times as many at the third or three-digit level, and nearly 500 altogether at the fourth or four-digit level. Industries at the four-digit level still encompass a variety of individual products, and these are identified to some detail by three additional digits suffixed to the industry designator to constitute a seven-digit product code.

Information on the manufacturing industries is collected periodically in terms of the SIC system, giving some information on product shipments as well as information on costs, employment, payrolls, value added by manufacturer, and other economic variables. Such information has been analyzed in many ways and particularly in terms of structure matrices showing the interindustry flows of intermediate products coming as output from some industrial sectors and serving as inputs to others.

If the structural relations of preattack periods remained valid in the postattack period, the effects on all industry of any predicted shifts in demand for final products could be derived. On an even less restrictive set of assumptions, models like PARM and STRENGTH could be used to investigate the possibility of surviving industrial capacity meeting stipulated schedules of requirements for recovery, superimposed on probable consumer demand. In the normal economy, this adjustment of all economic activity to changes in final demand is accomplished through individual decisions. The decision making that controls this undertaking

includes decisions by individuals to seek and accept employment (after considering wage and other differences in the opportunities available) and decisions to save, to invest, or to purchase goods and services with the disposable portion of their individual incomes. It includes decisions made by private entrepreneurs, or in the names of corporations or partnerships by their managements, to acquire new facilities and equipment, to diversify into new products, to raise or lower wages, to increase or reduce staff, to raise or lower prices, to retain or disburse earnings, to sell or buy back equity in stock, and to increase or decrease indebtedness. It includes decisions made by government agencies to increase, decrease, or reallocate government spending, to increase, refinance, or retire bonded indebtedness or to run at deficits covered by short term borrowing, to raise or lower taxes. It also includes decisions by officials of government agencies in connection with the regulation of private business, including review of tariffs, freight charges, rate formulas, earnings rates, mergers, fair pricing, fair employment practices, accurate accounting, advertising, public protection, and other efforts for the protection of the general public. How this decision making will operate in the post-attack period is not clear, since present arrangements depend heavily on the fate of all the economic institutions.

Corporation

In addition to being a device for raising capital for acquiring or constructing plants and other facilities, corporations have recently become devices for collecting managerial talent for business and industrial decision making and for organizing interestablishment flows of materials and intermediate products as well as flows of funds and funding authority. Direct effects of an attack on tangible assets and records, on managerial personnel at headquarters, subsidiaries, and individual establishments, as well as secondary effects on intracorporate arrangements, procedures, and flows will disrupt the internal operations of the corporation, its financial strength, efficiency, and external relations. Moreover, postattack regulations and other political constraints will complicate corporate operations and planning as much if not more than they will complicate activities of smaller unincorporated enterprises. Finally, some private entrepreneurs may be capable of responding to many types of postattack change more quickly and effectively than large corporations. The secondary effects of attack may thus make the corporate form of industrial organization less attractive relative to other forms while weakening many individual corporations.

Property

Although the right to hold private property is paramount in our legal and economic structure, this right has always been subject to limitations that have included the power of condemnation (or eminent domain) forcing involuntary sale to government agencies at judicially determined prices, the power to enjoin uses of property inimical to community interests, the

power to enforce maintenance of land and structures, legal responsibility for injuries incurred on property because of avoidable hazards, and various limitations on rights of landlords. Because of antimonopoly legislation, the rights of corporations and large private businesses to acquire property interests are subject to judicial review, but otherwise the property rights of corporations, partnerships, or other legally recognized institutions are as fully protected as those of individuals, and subject to the same limitations.

The immediate effects of an attack would be to destroy a large fraction of the national wealth. How this loss will affect individuals is very unclear. It is certain that normal tradeoffs or economic relations between income account items and assets will be drastically altered, both in their quantitative and in their qualitative or legal significance. Emphasis in economic planning and economic control will shift toward items of income; property questions may get deferred or tabled for later consideration after recovery and restoration of economic stability.

The value of surviving property will be drastically changed both in the aggregate and in differentials in its various types. The loss of facilities will be reflected partially in an increase in valuation of similar surviving facilities, but those having less postattack significance than preattack (because of changing demand) will lose value, at least relatively. Inflation; restrictions on liquidation, exchange, and transfer of capital and income producing facilities; rent controls; cost of establishing ownership and clear titles; and the uncertainties of future business conditions will all tend to reduce the value of physical assets relative to current income items. On the other hand, the need for reinvestment capital, the great and urgent need for specific facilities essential for survival, and general uncertainty will all tend to shift the relative valuation of immediate versus long term goals. This will be reflected in an increase in the interest and discount rates and a downward pressure on the value of surviving assets. The balance among these effects requires some type of model for analysis but most of the present models designed to describe very aggregative or macroeconomic relations are not suited to cases of the sudden displacement of values that would occur after nuclear attack.

The ultimate incidence of the economic burden of a nuclear attack is very difficult to anticipate. Actual loss is difficult to establish, except through the courts after analysis of alternative or conflicting claims. Questions of ownership are made even more unclear by cross indebtedness and widely distributed equity interests. Finally, the ultimate incidence of attack losses will depend on federal loss-equalization actions, if any, and also on federal fiscal policy generally.

Markets

The competitive market system is the mechanism that normally determines prices. Normally, the large auction-type markets determine prices

for primary materials, and wage negotiations determine labor costs. Changes in either tend to be reflected throughout the system, changing prices of final products somewhat differently. The bond markets and related financial and security markets, tend to determine the cost of capital and the rates of interest. Abnormally high wages are presumably resisted by greater capital investment and reduced employment. Low wages discourage such investment. The operation of the markets will depend on the availability of information, the availability of transportation for commodity movement, and some general understanding of government policy post-attack. It will also depend on the status of other economic institutions, particularly property, money and credit, and contracts.

In view of possible disruption of transport and national media of advertising, the familiar operation of competition in determining price may be complicated by postattack difficulties in reaching national markets with standardized products. Interindustry markets for equipment and raw materials or semifinished products will be dislocated with respect to their familiar geographical concentrations and may be vastly complicated by extreme regional price differentials. Stock and commodity future markets may become too specialized and fragmented for survival, because of uncertainties in the titles being sold, the lack of homogeneity in them, and the uncertainty of the status of all the participants. The free enterprise system is deeply rooted in the free market system. Any disruption of the market system could have serious impact on the free enterprise system.

Money and Credit

The uncertainty affecting property will spread to the whole credit structure. Credit is usually extended by the banking system and others with available funds to finance things as diverse as home purchases, installment buying, business and industrial expansion, and short term requirements for operating capital required by seasonal or cyclical industries. Collateral for credit can be property or faith in the earning capacity of the borrower. Both will be extremely uncertain postattack, as will the problem of deciding who has credit to extend. Part of the stability of the existing system is the presence of the courts to enforce terms of contracts and to assist in collections.

The extension of credit through the state and national banking systems, by loan and finance companies, by merchants, by industry to business, and even to consumers by financing subsidiaries of corporations, has greatly broadened the use of contracts as instruments of purchase and credit (and credit ratings) as factors in the lives of every individual and household. The widespread use of checking accounts for payments has come to dwarf the role of currency as a medium of exchange, although not as a standard of value. This change, which is still in process, has clarified the real relation of the money and credit system to the measurement of value, the determination of interest rates, and the appropriate

discounting of the future after giving consideration to inflationary tendencies, the rewards demanded for waiting, and general or specific uncertainties regarding future circumstances. The communication requirements for maintaining the credit system postattack, new uncertainties about the immediate and long term conditions of the economic system and even the inviolability of its basic institutions, and in particular the many unresolved questions of property rights and legal ownership will all tend to shake the foundations of the system of money and credit and confidence in it as an institution.

Contract

This brings the discussion to the contract as an institution. Written contracts and verbal agreements are binding and enforceable by appropriate courts, although contracts to engage in illegal operations, to harm others, or to consent to peonage, suicide, or other acts harmful to an individual or constituting waiver of his guaranteed rights have always been excepted. Limitations on recourse upon breach of contract include the opportunity for evasion through bankruptcy proceedings, the limited character of corporations that frees stockholders from liability in excess of their equity, and the limitation of many sales contracts to the right to repossess on default. Wage contracts, construction contracts, purchase and installment contracts, and other service contracts clearly specify terms of performance and payment, and these terms are interpreted by the judiciary as binding. The dynamic postattack situation, particularly during the first few months, will greatly reduce the value of contracts and faith in them. Forced breaches of terms will be widespread, and the whole value system underlying contract enforcement and negotiation may suffer. With plausible excuses for nonperformance at every hand and a greatly over-loaded judiciary, contracts may not be worth much. This would have repercussions on all other economic institutions.

Here are some of the features of the U.S. economic system that distinguish it from many other economies. The most distinguishing feature, as compared to other systems, is its freedom either from almost complete political control, as in the case of communist countries, or the control of a few wealthy and powerful individuals through major corporations and cartels, as is generally the case in more underdeveloped countries. The U.S. economic system is also distinguished by its highly developed industry, which in turn has created a large middle class, a more equal distribution of wealth than in most countries, a high standard of living for most of its inhabitants, and a well paid, highly organized laboring class. It is also distinguished by its reliance on private ownership to run and profit from the country's major utilities, such as transportation, electricity, and gas. This economy is, more than most, self-sufficient, not only in its food producing capacity but also in its raw materials and minerals, as well as its manufactured goods. It is, however, very interdependent with itself.

Partly because of the wealth engendered by its economic system, it has been possible for the United States to control to some extent the economies of other countries. The United States is one of the few countries in the world that has, through its private corporations, extended its profit making activities to other countries and thus become heavily involved in plants and equipment as well as other investment abroad. Other features of the U.S. economic system are:

1. Stability of the monetary system
2. Diffused and widespread ownership of corporations (through the stockmarket)
3. Partial separation of the banking system from the government
4. Diffused and widespread ownership of property, particularly home ownership
5. Large percentage of women in the work force
6. Rapid technological advancement, with consequent obsolescence of goods and jobs, and heavy reliance on complex machines
7. Heavy reliance on private industry for retirement programs, life and health insurance, and recreation
8. Proliferation of strong trade associations
9. Widespread use of credit
10. Highly specialized labor
11. Corporate control and wealth based less on family and class background than in most countries
12. Control of profit through competition and taxes
13. Restriction of the Negro in the labor market
14. Relatively large agricultural subsidies
15. Free labor market
16. Government bonds

How many of these features could be preserved in the postattack period and what adaptation would be required? It appears that all would be threatened and all would undergo some change. What countermeasures to threatened changes could be devised and how effective would they be? Qualitative economics could help to suggest countermeasures but could scarcely evaluate their effectiveness.

VII RELATIONSHIPS BETWEEN THE SUBSYSTEMS

Structural descriptions of the major subsystems are broken off in previous chapters at the point of identifying the nature of the relationships between inputs and outputs. Completion of that step is deferred to this chapter to allow the collection of all inputs and outputs to an institution in one place.

Table 17 collects all the variables noted in previous chapters and indicates the institutions for which each variable is either an input or an output, the variables listed vertically and the institutions listed horizontally. Cells of this matrix show an "I" if the corresponding variable is an input to the institution, and an "O" if the variable is an output from the institution. Some variables are both inputs and outputs to an institution, either because they are feedback variables or because they are outputs from one specimen of the institution, such as outputs from one corporation, and inputs to another specimen of the same institution.

The I's and O's in a column identify the complete set of inputs and outputs for an institution. From a single column, a structural matrix for that institution can be constructed to show what inputs are related to what outputs. The matrices obtained this way appear in Appendix B.

Some of the variables can be interrelated in a single relationship, while some variables can be involved in more than one relationship. Different specimens of an institutional type, such as different individuals and corporations, can be related to others of the same or different types, which will complicate the description of the relationships noted.

Many of the difficulties in discussing an incomplete matrix remained for completed ones. Some of the inputs have one significance for some institutions and collective or otherwise different significance for other institutions. Many variables are inputs for some exemplars of typical institutions and outputs for others. Rather than a discussion or defense of the selection of variables and their identification as inputs or outputs or an explanation of the nature of the relationships asserted, the problem of developing equations that might be included in a thought model for the total system will now be examined. The equations might be suggested by the variables identified in systems analysis, but that would have to be refined to reflect concepts with operational meaning, at least in a thought context, and be capable of more precise and consistent definitions. They would also have to be further screened for conceptual measurability and for relevance to pre- and postattack comparisons.

Starting again with the individual, any particular individual has certain characteristics that identify or classify him. Some of these

TABLE I7
SOURCES AND OUTCOMES TO INSTITUTIONS
OF THE U. S. SOCIAL STATISTICS

Table 17 (continued)

Type of Variable	Inputs									
Political	0	1	0	1	0	1	0	1	0	1
Rights	0	1	0	1	0	1	0	1	0	1
Balancing party	0	1	0	1	0	1	0	1	0	1
Party platforms	0	1	0	1	0	1	0	1	0	1
Elected officials	0	1	0	1	0	1	0	1	0	1
Strength of pressure groups	0	1	0	1	0	1	0	1	0	1
Active voters	0	1	0	1	0	1	0	1	0	1
Taxes	0	1	0	1	0	1	0	1	0	1
Government services	0	1	0	1	0	1	0	1	0	1
Government manpower	0	1	0	1	0	1	0	1	0	1
Form (or type) of government	0	1	0	1	0	1	0	1	0	1
Organization of government	0	1	0	1	0	1	0	1	0	1
Legislation	0	1	0	1	0	1	0	1	0	1
Organization	0	1	0	1	0	1	0	1	0	1
Strength of the military	0	1	0	1	0	1	0	1	0	1
Government debt	0	1	0	1	0	1	0	1	0	1
Government expenditures	0	1	0	1	0	1	0	1	0	1
Crime	0	1	0	1	0	1	0	1	0	1
Facilities and equipment	0	1	0	1	0	1	0	1	0	1

Table 17 (continued)

characteristics change with time or with other variables. Some relate to circumstances of birth, such as sex and date and place of birth. In many cases, these data coded and digitalized could identify a particular individual. If parentage is suggested by appending the sex and date and place of birth of each parent, identification of the child is almost certain.

With sex indicated by a "1" or a "0", the date of birth by seven digits for the day of month, month and year in the current millennium, and the place of birth by six digits, including two for the state or country, an individual can be identified by three names of 14 digits each, or 42 digits altogether. This designator alone identifies the ethnic grouping of foreign born or first-generation residents and allows recognition of most siblings. Multiple births can be indicated by using the first digits to indicate order of birth, reserving odd numbers for males and even numbers for females, to handle all cases except quintuplets. Problems arising with step parents and half-siblings are ignored in this fanciful illustration. The education of the individual can be indicated by two digits for the highest grade completed. His colleges can be indicated if the grade is more than 12 by using six for the college and major, or 12 for the last two attended.

Three digits can identify occupation, seven digits could identify business or employer, and five digits salary or income. Six digits can identify place of residence, but possibly four to six more are needed to give the exact address. Value of home in hundreds of dollars adds three digits and outstanding debts three more. Property owned can be identified by addresses and values appended. Marital status, number of children, church and association memberships add many digits more. Even a simplified scheme for identifying primary EAVO position requires at least scores and possibly hundreds of digits. Individual expenditure patterns can also be stereotyped but still require 20 or so digits.

This discussion emphasizes the complexity of a single individual. Even if the thought experiment were completed, allowing millions of digits to describe the current state of each of 190 million individuals, all the variables that tend to control his decisions would still not have been identified. It is also clear that any practical simulation of the total system should not be concerned with even a small sample of completely described individuals. Similarly, it is impractical to consider a sample of families.

Since a mathematical model for individual families or family members is not practical, attention must shift to large aggregates of individuals and greatly simplified sets of variables to characterize them. Many of these variables are correlated. Certain residential locations require substantial wealth and income, for example, and professions require education. But some kinds of homogenizing assumptions must be made, or even aggregates of individuals will be too diversified and distributed too irregularly for adequate treatment. Without forgetting the individual as the central mechanism in most social interactions, he must somehow be

reduced to an aggregate representing collective characteristics and averages.

An alternative is to ignore most individual differences, except those of interest for a particular type of relation, and to single out other differences for other relations. A simple two-way classification of individuals into age groups and income levels would lead to perhaps 100 cells for useful grain sizes. Correlations between age and income must simply be recognized and used when some variable is related to age and income.

This somewhat more practical model must envisage aggregations of individuals in different ways for obtaining inputs to different types of relations. For each such relation, therefore, *ceteris paribus* assumptions must be used regarding all suppressed variables--assumptions of homogeneity and statistical independence must be implicit throughout. Systems analysis provides guidance in recognizing the complexity of such assumptions and caution in departing from assumed independence. Here are some specifics.

The individual as economic man earns income, usually in the form of salaries or wages. The current number of wage earners and the distribution of their wage incomes can be determined. To estimate the savings for this group, the fraction of income saved could be related to the income level.

But there would be the question whether this relation also applied to landlords and investors. Because of BAVO differences in the classes, such relations would probably not apply exactly, even though income levels alone would probably dominate savings-income ratios.

As head of a household, the individual either rents or owns a dwelling. The total cost of ownership includes interest payments on any mortgage, taxes, maintenance, and income foregone from current equity. As a drain on current income, the costs of a dwelling tend to be comparable, whether owned or rented. Unless there is a specific interest in some question of ownership, a figure for annual expenditure on housing would probably be satisfactory. This would probably correlate well with income (or with real income) but might be more convenient as a relation between income and fraction of income spent on housing.

The fraction of income spent on food and beverages depends on income and the number of members of the household, but the dependence on family size is stronger at lower income levels than at upper. The same applies for clothing.

Expenditures on durables, including automobiles and household appliances, depend on the lapsed time since family formation. This kind of phasing tends to average out, except for bulges in the rate of family formation associated with war situations.

Wage earnings themselves depend on wage rates and levels of employment, after allowances are made for changes in the number of hours worked

by construction workers and others affected by strikes, or seasonal and cyclical unemployment. Wage rates are presumably affected by the size of the pool of unemployed, underemployed, or marginal and intermittent entrants to the labor force. But since Keynes, economists have noted that wage rates, real and actual, are relatively rigid and that economic cycles are better characterized by cycles of employment.

The discussion turns now to some of the individual's political roles. Ithiel de Sola Pool and his associates have simulated voter behavior in terms of social variables, such as ethnic grouping, religion, and income, but they have emphasized the relations between the likelihood of the voter going to the polls and such variables and the intensity of campaign pressures. As indicated, however, the individual's vote is perhaps less significant than his participation in pressure groups. This participation is likely to be influenced by changes in his economic status--his living and his working conditions. Local groups (such as representation from homeowners at a city council hearing on an application for rezoning) are usually informal ad hoc collections of persons with specific interests at stake. The factors leading to participation in such groups are direct and usually obvious, and the position of each individual is about what one would expect.

National pressure groups tend to be concerned with subtler, less immediate, more ideological issues, to have an appeal for a more diverse collection of people, and to be more formally and permanently organized. Many of these groups represent particular economic interests (petroleum, agriculture, and medicine, for example), but they tend to be identified better with a general position than with a single issue. Some groups, such as the American League of Women Voters, are concerned primarily with research and education, but they take sides on local, state, and national issues.

The factors that lead an individual to identify himself with a pressure group also lead him to join various associations. Information on the membership of organized groups is readily available, but information on the correlations between membership in different organizations is limited. Sampling the population to determine the overlapping of membership in different organizations would help clarify the BAVO position of individuals and groups.

Relations of the individual to language--to information exchange, storage, and retrieval--result in annual contributions to written material, to the number of telephone calls, to the number of pieces of mail handled, to the number of TV viewers and radio listeners, and to the circulation of newspapers and periodicals. Most of these volumes of use can be measured.

This discussion of the individual's roles could now be expanded to relate associations, corporations, governmental bodies to each other and to different aspects of the total system. This is not done here, but instead the kinds of quantitative variables that can be associated with each institution are listed in Table 18.

Table 18
VARIABLES OF U.S. INSTITUTIONS

1. Individuals

Total population by age and sex
Total population by race and ethnic extraction
Number of commuters
Population by highest grade completed
Number of mentally ill
Number hospitalized
Population by occupation
Unemployed
Citizens of voting age
Labor force
Number of licensed drivers
Number of widows, orphans
Number of self-employed
Number of wage earners
Number in management
Number of illiterates
Number by marital state
Birth rate
Death rate
Marriage rate
Fecundity rate

2. Language

Number of telephone subscribers
Number of telephone calls
Total telephone charges
Amounts of mail carried
Number of post offices
Total value of post offices
Total investment in radio and TV stations
Number of radio stations
Number of radios
Total radio program hours
Total radio listeners, in hours
Number of TV stations
Number of TV sets
Total TV program hours
Total TV viewers, in hours
Number of newspapers
Value of newspaper and magazine plants
Total newspaper lineage
Total newspaper circulation
Number of magazines and periodicals
Number of pages published
Total periodical circulation
Number of books published

Table 18 (continued)

Number of pages published
Number of books sold
Number of libraries
Value of library structures
Library circulation

3. Families

Number of families
Number of households
Number of marriages
Number of divorces
Number of separations
Number of deaths, married
Number of deaths, unmarried
Number of orphans
Number of widows
Number of widowers

4. Groups

Number of businesses
Number of establishments
Number of inhabited places

5. School

Number of elementary schools
Number of private elementary schools
Number of high schools
Number of private high schools
Number of private colleges
Number of state colleges
Enrollment of elementary schools
Enrollment of high schools
Enrollment of colleges
Enrollment by grade
Adult population by highest grade completed
Number of school drop-outs
Number of teachers, elementary grades
Number of teachers, high schools
Faculty members, colleges and universities
Costs of education, by level
Value of school facilities, by level

6. Church*

Number of church members
Church attendance

* All variables by sect, denomination, and religion.

Table 18 (continued)

Number of churches
Value of church structures
Church contributions
Church indebtedness
Number of clergy
Cost of church operation
Date first church established
Value of church investment in SMSAs
Number of church members in SMSAs
Church attendance in SMSAs

7. Association

Number of associations
Number of members, major associations
Date established, major associations
Annual receipts, major associations
Value of property owned, major associations
Number of chapters or branches, major associations

8. Community

Number of census tracts
Crime rate by tract
Value of housing per capita
Average family size
Number on relief
Relief payments
Home ownership

9. Pressure Group

Number of registered lobbies
Number of registered lobbyists
Number of trade associations
Number of trade journals
Number of property owners
Funds spent by pressure groups
Number of members of organized groups
Attendance at legislative committee meetings
Attendance at other open government meetings
Attendance at rallies
Number of rallies
Number of demonstrations
Number of demonstrators

10. Legal System

Number of laws passed each year
Number of lawyers
Number of court officials

Table 18 (continued)

Number of cases judged
Judicial backlog of cases
Number of criminal convictions
Number of estates probated
Number of foreclosures
Number of condemnation proceedings
Number of divorces
Number of jury trials
Court costs per case
Average time per case
Antitrust cases

11. Political Party

Number of elective offices
Campaign expenditures by state and party
Number of registered voters, by party
Number of votes cast
Number of precincts
Voter preferences by religion, race, ethnic groups
Voter preferences by income
Voter preferences by level of education
Attendance at party meetings
Number of splinter groups within the party
Number of candidates

12. Municipality or Township

Number of incorporated places
Number of unincorporated places
Number of city managers
Number of mayors
Number of municipal bond issues
Value of municipal bonds outstanding
Cost of local government
Number of city or township employees
Taxes collected
Number of towns, cities, and townships

13. County

Number of counties by state
Number of county managers
Number of county supervisors
Number of sheriffs' deputies
Number of county employees
Cost of county government
Total assessed valuation
County tax collections
Tax rates
County welfare payments

Table 18 (continued)

14. Special District

Number of school districts
Number of water districts
Number of fire districts
Number of water pollution districts
Number of air pollution districts
Number of mosquito abatement districts
Number of sanitation districts
Value of facilities held
Special bonds outstanding
Number of employees

15. State

Number of state elective officials
Number of state employees by agency
State debt
State expenditures
State tax revenues
Crimes reported by category
State relief or welfare payments
Sales tax receipts
State income tax revenues
State gasoline tax collection
State highway expenditures
Auto license fees
Drivers license fees
Number of corporations chartered
Number of state banks

16. Federal Government

Federal expenditures
Income tax revenues
Other tax revenues
Number of Federal employees by department or agency
Number of Federal elected officials
Number of appointive offices
Federal debt
Annual cost of debt funding
Value of Federal currency outstanding
Number of executive orders
Number of laws passed
Number of servicemen
Number of living veterans
Value of Federal buildings
FICA coverage
Value of Federal stockpiles

Table 18 (continued)

17. Union

Number of unions
Number of union locals
Number of union officials
Number of union members
Total union receipts
Amount in union welfare funds
Number of strikes
Days lost by strikes
Number of contract negotiations
Number of arbitrations

18. Business

Number of businesses
Business receipts
Business profits
Business employment
Business payrolls
Business debt
Business assets
Equity capital invested

19. Industry

Number of establishments
Number of employees
Total wages bill
Debt by industries
Capital invested by industry
Value added by industry
Sales by industry
Value of inventories
Value of physical plant and equipment
Hours worked
Interest paid
Interest received

20. Corporation

Number of corporations
Corporate sales by business or industry
Corporate debt
Dividends paid out
Undivided surplus
Total assets of corporation
Net worth of corporation
Number of stockholders
Corporate profits or earnings
Number of mergers
Market value of stock outstanding

Table 18 (continued)

21. Property

Number of deeds
Value of stocks outstanding
Value of farms
Property tax collection
Value of inventories
Value of land
Value of commercial and industrial facilities
Value of property sold or exchanged
Value of commercial and industrial equipment
Value of residences

22. Markets

Number of commodity markets
Futures sales
Stocks exchanged, shares and market value
Bond market yields
Livestock market sales and prices
Metals prices

23. Money and Credit

Currency outstanding
Bank deposits
Bank loans
Bank clearings
Bank debts
Savings accounts
Installment debt
Corporate bonds
Prime interest rates
Accounts receivable
Bad debts
Business failures
Insurance receipts
Insurance claims
Savings and loan assets
Bank capitalization
Bank reserves
Government debt
Private debt
Net worth
Farm loans
Cost of servicing government debt

24. Contract

Number of installment contracts
Value of installment credit outstanding

Table 18 (concluded)

Union contract negotiations
Number of contract awards
Value of contract awards
Insurance policies in force
Number of annuity contracts
Number of contract defaults
Number of contract renegotiations
Value of government contracts let
Number of foreclosures
Number of leases

Consideration is given to whether a practical quantitative model can be synthesized from these variables. The discussion, therefore, turns from the goal of developing a mechanistic micromodel or microtheory encompassing all classes of variables identified in the system analysis to a more statistically descriptive, and less explanatory model.

These variables can be regarded as time series, each measuring some aspect or factor related to the institution in question. These variables, or their annual increments, would need to be related to other variables, as seems appropriate. Otherwise, trends would be assumed to be empirically determinable from time series correlations, or from correlations with population and income, either regionally or nationally.

VIII POSSIBLE EFFECTS OF AN ATTACK AND RECOVERY POSSIBILITIES

Direct and Indirect Effects

Direct effects of an attack relate only to physical damage to buildings and facilities, equipment, and inventories, to denial of areas, facilities, and supplies by contamination, to loss of life and injuries and radiation dosages, to increased hazards created by such effects, and to the psychological impact on immediate survivors.

Indirect effects on the subsystems begin to accumulate immediately as consequences of the direct effects. Regardless of the severity of the attack, or the active and passive defenses used, direct effects will inevitably lead to the primary effects shown in Table 1, although the severity of the attack and the effectiveness of defenses and counter-measures will affect the extent of these effects. Nevertheless, the primary effects on these systems will initiate consequences that produce the secondary effects listed in the Table 1, doing so through perturbation of the preattack states of the basic institutions. The task here is to use the systems analysis to develop a check list of possible perturbations to the three major systems and to discuss their possible course of subsequent interaction.

Some of the possible effects have already been suggested, even in the broad, incomplete form of the analysis to this point. Some of the most important factors are listed in Table 19. It is expected that these effects would begin to be noticed soon after emergence from shelter. A few might be dealt with adequately in the first few months after attack, others in the first year. Most of them, however, would persist until recovery was essentially complete. Impressions of the probable period of greatest impact or risk are included in the table as a starting point for considering phasing. The effects noted correspond generally to those listed in Table 19.

New social pressures coming largely as consequences of these possible effects, of more general conditions, or of actions taken in response to them, can be expected to produce some of the institutional changes listed in Table 20. Factors that might be primary contributors to these changes are also listed, along with guesses at the periods when these changes might first appear. Some are alternative extremes. The directions they are likely to take should become clear in the first few months after attack.

There are a number of pronounced trends in the characteristics of major institutions, including a number listed in Table 21. Examination of those identified indicates that they are likely to continue, unless more drastic institutional changes intervene, but that about half of

Table 19
POSSIBLE INDIRECT EFFECTS OF
AN ATTACK AND THEIR IMMEDIATE CAUSES

Possible Effect	Immediate Cause	Period of Greatest Risk (weeks after attack)
Sociocultural		
Provincialization	Transportation problems	3-52
Change in individual status	War losses	4-13
Change in group status	Demands of postattack	4-13
Changes in status of parents	Problems of strained circumstances	3-13
Changes in status of leaders	Problems of strained circumstances	3-52
Orphans and unsupervised children	Death of parents	1-6
Delinquency	Loss of parental control	4 on
Crime	Loss of deterrents, gain in opportunities	2 on
Anomie, boredom	Shelter confinement, austerity immobility	2 on
Lower educational level	Loss of schools, labor requirements	3 on
Homogenization	Close living and shelter expenses	1 on
Loss of private welfare services	Weakened national associations	4 on
Unstable goals, standards	Disruption of normal BAVO standards	13 on
Dehumanization	Sight of death and destruction	2-13
Shifts in racial and ethnic friction	Death and relocation	4 on
New claims for social justice	New minority alignments	8 on
Multifamily housing	Loss of housing	3 on
Uncertainty of status	Bankruptcy, prolonged litigation	2 on
Increased interclass mobility	Changes in effective demand	4 on

Table 19 (continued)

Possible Effect	Immediate Cause	Period of Greatest Risk (weeks after attack)
Political		
Emergent leadership	Shelter emergence problems	2-5
Loss of civic responsibility, voter apathy	Reduced education, personal problems	26 on
New fringe groups	Emergent groups and changing group status	13 on
Political realignments	Reaction to pressure groups	26 on
Loss of civil rights	Weakened national associations	13 on
Susceptability to demagoguery	Exposure to risk	4 on
Localization of political control	Remoteness of state and federal control	1-13
Loss of public welfare processes	Loss of government facilities and supporting services	3-13
Loss of government processes		3-26
Slowdown of government processes		3 on
Vast increase in law suits pending	Uncertain titles, debts	6 on
Increased local self dependence	Remoteness of state and federal governments	3-13
Uncertainty in legal compliance		3-26
Uncertainty in law enforcement	Emerging shifts in power structures and jurisdiction among federal, state, and local governments	3-26
Slow restoration of federal power		13 on
Further weakening of judicial process		8 on
Strengthening of executive branch	Emergency	3 on
Uncertainty in court decisions	Court slowdown, lack of precedent	6 on
Malapportionment	Death and relocation	3-26

Table 19 (continued)

Possible Effect	Immediate Cause	Period of Greatest Risk (weeks after attack)
Political (cont.)		
Uncertainty in tax policy	Budget problems	4-52
Reorganization of election machinery	Malapportionment and re-registration	4-13
Readjustment of party platforms	Power shifts, political demography, new pressures	13 on
New parties	Power shifts	26 on
Increased legislative workload	Emergency problems	4 on
Economic		
Loss of production	Confinement or shelters	1-3
Immobility of labor force	Transportation shortage	3-52
Change in corporate management	Death, changed circumstances	4-13
Changed retail market	Uselessness of many pre-attack products	2 on
Changes in labor force	Death, marginal workers	3-8
Changes in labor management	Changed demand and sequence of recovery	4 on
Loss of productivity	Lowered worker morale	4 on
Lowered skill of labor force	Reduced education, marginal workers	13 on
Negative attitudes toward hazardous occupations	Exposure to risk	3 on
Title uncertainty	Loss of records	3 on
Loss of basis for trust and credit	Uncertain titles and compliance	3-13
Uncertainty in loss sharing	Incomplete plans and pronouncements	4 on
Uncertainty in accrediting corporate management	Organizational and legal problems	4 on
Uncertainty in trade regulations	Problems of jurisdiction and enforcement	4-13

Table 19 (concluded)

Possible Effect	Immediate Cause	Period of Greatest Risk (weeks after attack)
Economic (cont.)		
Lowered quality standards for goods	Production problems, changed demand	8 on
New demands for social welfare	New welfare groups	8 on
Reduction in GNP per capita	Loss of capacity and productivity	2 on
Financial instability	Bankruptcy	4 on
Inflation	Changing demand, lowered production	6 on
Structural unemployment	Change in labor requirements	13 on
Reduced productivity of capital	Changes in labor force composition	4 on
Loss of decision making effectiveness	Disruption of corporate management	5-13
New classes of expeditors	Disruption of market channels	8-32
Government assistance in distribution		

Table 20

POSSIBLE INSTITUTIONAL CHANGES IN THE AFTERMATH OF AN ATTACK,
FACTORS CONTRIBUTING TO THEM, AND POSSIBLE TIME OF APPEARANCE

Possible Change	Contributing Factor	Possible Time of Appearance (months after attack)
Sociocultural		
1. Secularization of religion	Welfare needs	3
2. Birth or rebirth of religion	Attack trauma	6
3. Lowered general level of education	Loss of schools, teachers, students	3
4. Reduced family role	Unsettled housing, role changes	2
5. Increased family role	Loss of schools, community ties	2
6. Increased family conflict	Housing, uncertain roles	1
7. Proliferation of associations	New groups with common experiences	3
8. Provincialization of associations	Loss of national headquarters	1
9. Suppression of associations	Threat to executive	6
Political		
10. Proliferation of pressure groups	New demands for social justice	3
11. Provincialization of pressure groups	Loss of national cohesiveness	3
12. Suppression of pressure groups	Threat to executive	6
13. Proliferation of parties	Dissent within major parties	6
14. Provincialization of parties	Regional differentiation	6
15. Suppression of any second party	Dominance of one party	12
16. Executive dominance	Emergency powers, slow due process	3
17. Weakened executive branch	Lack of staff support, legislative cooperation	3
18. Federal dominance	Emergency powers, state ineffectiveness	2
19. State dominance	Federal remoteness or ineffectiveness	2

Table 20 (concluded)

Possible Change	Contributing Factor	Possible Time of Appearance (months after attack)
20. Local dominance	Remoteness and ineffectiveness of higher authority	2
21. Totalitarianism	One-party dominance, strong-man leader	1 or 12
22. Anarchy	Rebellion, loss of confidence, scapegoating	2
23. Lawlessness or anomie	Loss of leadership, purpose, control	2
24. Weakened or overloaded judiciary	Suits, claims, lack of precedent	1
Economic		
25. Weakened corporations	Uncertainty, loss of management, cohesiveness	1
26. Monopolistic corporations	Mergers, loss of anti-trust safeguards	3
27. Abolition of private property	Confusion of titles, change in government	3
28. Nationalization of some property	Transportation and utility problems	2
29. End of competitive markets	Runaway speculation	2
30. Breakdown of credit system	Bankruptcy, uncertainty, poor communications	1
31. End of installment credit	Uncertainty, difficulty with collections	1
32. Inflation	Scarcities, loss of production	1
33. Decline of property values	Uncertainty of future, inflation	1
34. Lowered contract compliance	Difficulties with performance	2

Table 21

TRENDS TYPICAL OF PRESENT SOCIETY AND
THEIR PROBABLE COURSE AFTER THERMONUCLEAR ATTACK

Group A Immediate reversal followed by gradual resumption

1. Shortening workweek
2. Increasing automation
3. Growth of large corporations
4. Centralization of corporate management
5. Spread to national markets
6. Increased dominance of management class in corporate decision making
7. Increased dependence on communications and transport
8. Increasing labor mobility
9. Increasing urbanization
10. Increasing nucleation of families and households
11. Increasing independence of parental authority
12. Secularization of religion
13. Increasing industrial integration
14. Decreasing likelihood of significant third parties
15. Increasing discretionary income
16. Increasing dominance of federal government

Group B Continuance or acceleration of trend

17. Separation of church and state
18. Separation of church and education
19. Increasing social mobility
20. Increasing equality
21. Decreasing personal liberty
22. Increasing conformity
23. Socialization of medicine
24. Increasing savings/income ratio
25. Increasing tax burden
26. Increasing dominance of executive branches of government at all levels
27. Increasing federal welfare program

them might be reversed for awhile by an attack. These are listed as Group A.

Those listed as Group B are likely to continue undisturbed and perhaps even be accelerated. Among these, a few could be drastically altered by other events, such as the rise of a new dominant religion, collapse of federal and state governments, or a totalitarian takeover. Labor mobility listed in Group A might be accelerated if transportation were readily available, and secularization of religion might be accelerated if religious feelings were not stirred by the transattack experience.

With the emphasis on institutional effects, little reference has been made to the indirect physical effects of an attack. The loss of transportation capabilities, the stoppages throughout industry, and the problems of morale and retraining of labor would all contribute to a reduction of productivity of capital and labor. This would aggravate shortages certain to follow the loss of capacity itself. Restoration of the normal cycles of agriculture would depend on the time of attack in the cycle, reduction of the fallout hazard, and the availability of agricultural inputs. Resumption of agricultural production would be high in any list of priorities, but might not involve much activity for some months.

The sequence of reconstruction emphasis would probably resemble that of Table 22, although circumstances could change these schedules. Significant output from restored plants would lag from 6 to 18 months after the start of conversion or reconstruction. This would mean that production of appliances and other consumers durables might not resume for three years. Residential construction, except for improvised barracks and similar temporary shelters, would not be likely for two years. Adequate gasoline flows would not be forthcoming before the last quarter of the first year. Generally, high cost of transportation, immobility, provincialization effects, and related problems would persist throughout the first year.

The planning horizon for rehabilitation would thus extend over at least three years, and possibly as long as five. To maintain this schedule, patience and high rates of savings would be essential. Variables in BAVOs would indicate whether postattack leadership could resist pressures to reorder the rational schedules.

Requirements for Recovery

Any assessment of total vulnerability must involve consideration of the prospects for recovery. What is meant by recovery must therefore be clarified, at least to the extent of establishing some reference criteria bearing on the question of recovery from what to what. A possible criterion from the point of view of tangible ecological or economic factors would require restoration of enough economic capacity to sustain some minimal then-surviving population at a stable

Table 22
POSSIBLE PRIORITIES FOR RESTORATION OF FACILITIES

Facilities to be Restored	Timing	
	Month Started	Month Producing
1. Power system	1	1
2. Community utilities	1	2
3. Telephone long lines	1	2
4. Fuel transmission lines	1	2
5. Transportation network	1	3
6. Gasoline refineries	1	6
7. Vegetable oil production facilities	1	6
8. Facilities for drugs and pharmaceuticals	1	6
9. Steel production	3	12
10. Food processing plants	3	12
11. Production of construction materials	3	12
12. Construction equipment production facilities	3	12
13. Facilities in petro-chemicals	4	15
14. Other chemical plants	4	15
15. Primary metal refining activities	4	15
16. Metal fabrication facilities	4	16
17. Textile mills	6	18
18. Machinery and equipment plants	6	18
19. Electrical equipment plants	6	18
20. Electronics plants	9	18
21. Transportation equipment plants	9	18
22. Consumers nondurables plants	12	24
23. Producers intermediates	12	24
24. Consumers durables plants	18	36

or increasing level, with a standard of living that was at least rising. Differences between this and any other criterion for physical recovery would merely concern recovery time. From the point of view of institutional factors, however, acceptable criteria are not as easy to select.

The preceding section discussed some possible institutional consequences of the primary effects of an attack. From which of these must we recover before we can be persuaded that society has survived? To what types of institutional structures might recovery have taken us to be acceptable?

As a first step toward considering these questions, Table 23 classifies the possible institutional consequences of an attack listed in Table 20 according to their acceptability or unacceptability, their desirability or unimportance. It also labels these changes according to the prospects for reversing them. A more detailed ranking of possible changes in terms of acceptability would be desirable, but in the absence of an adequate rationale for ratings, the categorization is based on a general impression of the acceptability of these changes to the average person. Most extremists would disagree with many of the assignments, and most moderates would disagree with some of them. Perhaps as a result of some presumed antipathy to change, of the inherent bias of a search for possible perils, or of the unredeeming horror of nuclear attack, only one change has been labelled desirable, the possible strengthening of family ties, and it appears to be readily reversible. The possible proliferation of associations was rated as unimportant or desirable with fair chances for reversal. On the other hand, all the highly unacceptable changes, except a weakened or overloaded judiciary, which presumably could be corrected in time, have poor chances of reversal because of self-perpetuating characteristics.

Mention of possible changes in the individual are omitted from this list, whether they are in his psychological state and its socio-cultural basis, or in his economic and political rights, freedoms, and responsibilities that are not covered by broader institutional changes. Table 24 lists a number of individual rights that might be lost or impaired in the changes following an attack, and rates their acceptability and prospects for reversal. None of these losses seems desirable, and only one has a good chance of reversal. Only two were rated as highly unacceptable, but many might rate them all as highly unacceptable, particularly those rated here as unacceptable. The six regarded as unimportant would be unacceptable, except temporarily, and two of them (those relating to the right to speculate in stocks or otherwise) would have poor chance of restoration if abrogated.

Granting the unacceptability of many of these possible institutional changes, analysis of vulnerability must examine the factors that could contribute to them, appraise their likelihood, consider countermeasures, and carefully assess methods and prospects of avoiding or undoing them. Systems analysis and the qualitative methods of functional sociology,

Table 23

**POSSIBLE INSTITUTIONAL CHANGES IN THE AFTERMATH
OF AN ATTACK, THEIR ACCEPTABILITY, AND
PROSPECTS FOR REVERSAL**

Possible Change	Acceptability	Prospects for Reversal
Sociocultural		
1. Secularization of religion	Unimportant	Poor
2. Birth or rebirth of religion	Unimportant	Poor
3. Lowered general level of education	Unacceptable	Good
4. Reduced family role	Unimportant	Fair
5. Increased family role	Desirable	Good
6. Increased family conflict	Unacceptable	Good
7. Proliferation of associations	Unimportant or desirable	Fair
8. Provincialization of associations	Unimportant	Good
9. Suppression of associations	Unacceptable	Poor
Political		
10. Proliferation of pressure groups	Unimportant	Fair
11. Provincialization of pressure groups	Unimportant	Fair
12. Suppression of pressure groups	Unacceptable	Poor
13. Proliferation of parties	Unimportant	Good
14. Provincialization of parties	Unimportant	Good
15. Suppression of any second party	Highly unacceptable	Poor
16. Executive dominance	Unacceptable	Fair
17. Weakened executive branch	Unacceptable	Fair
18. Federal dominance	Unimportant	Fair
19. State dominance	Unimportant	Fair
20. Local dominance	Unacceptable	Poor
21. Totalitarianism	Highly unacceptable	Poor
22. Anarchy	Highly unacceptable	Poor
23. Lawlessness or anomie	Unacceptable	Fair
24. Weakened or overloaded judiciary	Highly unacceptable	Good
Economic		
25. Weakened corporations	Unimportant	Fair
26. Monopolistic corporations	Unacceptable	Fair
27. Abolition of private property	Highly unacceptable	Poor
28. Nationalization of some property	Unimportant	Fair
29. End of competitive markets	Unacceptable	Poor
30. Breakdown of credit system	Unacceptable	Poor
31. End of installment credit	Unimportant	Poor
32. Inflation	Unacceptable	Fair
33. Decline of property values	Unimportant	Fair
34. Lowered contract compliance	Unacceptable	Fair

Table 24

**RIGHTS OF THE INDIVIDUAL THAT MIGHT BE ABROGATED
AS CONSEQUENCE OF AN ATTACK, THEIR
UNACCEPTABILITY AND REVERSIBILITY**

Possible Restriction of the Right to:	Acceptability	Prospects for Reversal
1. Select a spouse	Unacceptable	Good
2. Attend school	Unacceptable	Fair
3. Attend church	Unacceptable	Fair
4. Associate	Unacceptable	Fair
5. Agitate	Unimportant	Poor
6. Assemble	Unacceptable	Fair
7. Vote secretly	Unacceptable	Fair
8. Run for office	Unimportant	Fair
9. Choose a party	Unacceptable	Poor
10. Engage in political activity	Unacceptable	Fair
11. Apply for welfare	Unacceptable	Fair
12. Demand a fair trial	Highly unacceptable	Fair
13. Equal treatment	Unacceptable	Fair
14. Buy or sell property	Unacceptable	Fair
15. Own a car	Unimportant	Fair
16. Move about freely	Unacceptable	Fair
17. Change occupation	Unacceptable	Fair
18. Change employment	Highly unacceptable	Fair
19. Enter into business	Unacceptable	Poor
20. Buy or sell stocks	Unimportant	Poor
21. Rent to or from others	Unacceptable	Poor
22. Borrow or lend money	Unacceptable	Poor
23. Join a union	Unacceptable	Fair
24. Refrain from joining a union	Unimportant	Fair
25. Speculate	Unimportant	Poor
26. Collect interest	Unacceptable	Poor
27. Shop freely	Unacceptable	Fair
28. Enforce a contract	Unacceptable	Fair
29. Bargain	Unacceptable	Fair

political science, and institutional economics may help identify contributing factors and suggest countermeasures and remedies. But in order to appraise the likelihood of potential changes or the effectiveness of countermeasures and remedies, a great advance is required in social psychology and its neighboring disciplines and in political science and institutional economics, all supported by good observed data and established empirical relationships. Lacking this, construction of adequate simulators should provide some notion of the relative sensitivities of possible changes to the factors contributing to them. If the simulators proved to be incomplete or unpersuasive regarding the assessment of the likelihood of change, they could still provide quasi-experimental evidence on the relative effectiveness of countermeasures. In the absence of results from the methodological program outlined, the requirements for recovery from attack hazards related to institutional changes must be left unspecified.

Discussion of the possible indirect consequences of an attack has suggested a time sequence for their development derived from considerations of qualitative relationships and responsiveness of interactions. The discussion now turns to consideration of the sequence of the development of indirect effects on tangible economic factors and tries to compare these schedules of critical events, hopefully to throw some light on the shape of the sequence of recovery requirements.

Comparison of Tables 19, 20, and 22 shows that institutional and other social pressures would be highest towards the middle of the first year, before significant amelioration of scarcities could be noticed. If restoration of gasoline production is delayed beyond the midyear target, for example, social pressures and trends could generate considerable momentum.

The likelihood of these institutional changes depends heavily on political conditions and on the nature and strength of the BAVO position of the general population. It also depends on the ability of the government to stabilize economic conditions, to develop, clarify, and begin implementing loss-equalization policies of some general persuasiveness, to establish streamlined procedures for equitably resolving questions of corporate identity and responsibility, to regulate profiteering, to announce specific schedules for residential construction, to guarantee enforcement of emergency business regulations and contract performance, and to reestablish channels for check clearings, credit examination, and in general to provide acceptable bases for mutual trust and confidence among businessmen, management, labor, and consumers.

The first year--especially the first six months--is critical for the successful application of countermeasures to possible institutional collapse. The likelihood of such collapse is hard to assess, and the requisite countermeasures to oppose it have never been formulated. The steps that seem necessary are listed below:

1. Preattack development of loss-equalization policy.
2. Preattack draft of supporting legislation.
3. Preattack plans for debt clearance.
4. Preattack plans for title clearance.
5. Development of streamlined emergency procedures for budget preparation and review.
6. Development of streamlined emergency procedures for setting tax rates and policy.
7. Preattack consideration of forced savings schemes.
8. Development of streamlined emergency procedures for legal recognition of corporate management, and corporate identity.
9. Development of streamlined emergency procedures for corporate mergers, dissolution, reconstruction with formulas for terms of settlement.
10. Preattack registration of plant or facility ownership.
11. Preattack plans for streamlined emergency condemnation, for plant purchase.
12. Preattack plans for market stabilization, not only pricewise but for establishing nationalized brokerage functions if necessary.
13. Government intervention to make or find markets for semi-finished products or materials or to find vendors.
14. Government plans to guarantee payments and deliveries, or to act as broker for buying at the source for resale and delivery to points of most essential demand.
15. Preattack plans for stabilization of the insurance industry.
16. Plans for stabilizing banks and clearing operations.
17. Integrate consumer finance operations with any forced savings schemes.
18. Plan for and schedule residential reconstruction.
19. Plan for temporary billeting.
20. Plan for support of school system.

The problems of implementing such countermeasures have not been thought through, and probable effectiveness of the countermeasures, once implemented, has not been determined. Their effectiveness must depend largely on leadership, on the adequacy of the implementation, and on their effects on the BAVO position, as well as their effects in support or rejection of unacceptable institutional changes. To analyze this type of question further would require BAVO data and better theory than is now available.

IX METHODOLOGY FOR ASSESSING TOTAL VULNERABILITY

The complete disappearance of the U. S. social system seems inconceivable, except in terms of the destruction of all its parts. As long as there are survivors, some kind of societal function should also survive. For example, it seems unlikely that anything less than the arrival of a test-tube utopia would eliminate the procreative and early child rearing functions of the family. The permissive, nondogmatic, and diffuse character of modern religious beliefs make it unlikely that anything could stamp out the church completely. On the contrary, the more conceivable possibility would be the ascendancy of some new fanatical religion. Even with a general shrinking in the technological base of the economy, it is inconceivable that anything less than an externally based tyranny would stamp out some system of universal, free, compulsory education. Poor management of recovery could conceivably destroy the industrial base of the economy, but it does not appear likely.

All these changes may be important, even likely, but they are matters of degree. They would not destroy the institutions affected, and they could eventually be reversed if circumstances were favorable. On the other hand, there is the possibility that some features of our society might be suppressed entirely, to the point where any restoration would be unlikely. What appear most vulnerable are the institution of private property, the delicate balance of the competitive market system, the basis for trust underlying the credit system, openly held shares, public scrutiny and government control of corporations, and the rights, guarantees, and democratic principles of our political system. Assessing the vulnerability of these institutions requires tools more delicate and persuasive than those considered thus far.

Although industry has not appeared fatally vulnerable, a heavy attack would seriously impair all normal operations and necessitate emergency actions of unprecedented scope and power. The nature and method of these actions and the timing achieved with them would vitally affect their chances of success and the chances of eventual return to a more traditional society. To examine the many alternatives involved in such questions, a much more detailed understanding of the economic system than generated thus far. Past studies of industrial and economic vulnerability have gone into detail in the analysis of surviving capacity, the requirements for repair, conversion, and reconstruction of capacity, the allocation of facilities and other resources, and the feasibility of meeting alternative schedules for economic support and recovery. The attention devoted to institutional and organizational aspects of recovery management, however, has been hopelessly limited.

Progress on methodology might provide an abstract framework for separating questions of structure from questions of policy. What appears needed first is a detailed systems analysis of each of the individual economic institutions themselves. This chapter presents a first attempt at such an analysis.

Detailed Analysis of Economic Institutions

As in the initial examination of the economic system, the analysis begins by identifying a number of subsystems, this time 36, emphasizing different economic activities. Further subdivision or alternative grouping and classification could have been followed, but the suggested structure appears practical and sufficient. These subsystems and their primary activities or functions are listed in Table 25. Most of the subsystems are relatively standard and are not discussed here. However, a few novel designators or classificatory conventions need explanation.

- The rentier receives rents, interest, or dividends from invested capital, without direct operational or managerial involvement. If he also manages, his earnings include a fee for management. He owns real property for rent or capital assets such as cash in securities, reinvesting income and speculating against inflationary forces.
- The professional manager, a member of a proliferating class born with the public corporation, is also involved in handling property. He works for wages, however, in contrast to the vanishing entrepreneur, who uses his own capital assets as venture capital in new undertakings.
- The traditional division between trade and industrial unions now relates primarily to the timing and geographical extent of wage contract negotiations.
- As before, the concern with the corporation is with its financial and management aspects, but some holding company activities are largely paper organizations for investment purposes, while most have operating interests in the management of other businesses and industries. Most of the industries are corporate controlled, and the individual industrial entrepreneur is rare.
- Rental property can be held by individual rentiers or by corporations and businesses, but facilities are almost always owned by business or industry and usually by the owning organization. Exceptions are commercial leases, regarded here merely as rental property. Residential property can be owned or rented, but "residences" are arbitrarily restricted here to mean owner occupied. Capital assets are essentially cash, deposits, or securities, but they also include patents, copyrights, and other income earning intangibles.
- As before, the concern with markets is limited to those involving continuous equalizing of bids and offers. Markets here do not include retail sales and labor markets, simply because these operate differently

Table 25

SUBSYSTEMS OF THE ECONOMIC SYSTEM

Institution	Subsystem	Primary Function or Activity
Individual	1. Worker 2. Consumer 3. Rentier 4. Entrepreneur 5. Manager	Working Buying Investing Risk taking Managing
Unions	6. Trade union 7. Industrial union	Collective bargaining Collective bargaining
Businesses	8. Retail trade 9. Wholesale trade 10. Consumer service 11. Commercial & industrial serv.	Merchandising Wholesaling Servicing Servicing
Industries	12. Consumers consumables 13. Consumers durables 14. Producers consumables 15. Producers durables 16. Construction 17. Utilities 18. Transportation	Producing Producing Producing Producing Building Supplying power and communication Moving
Corporations	19. Financial 20. Management	Investing Operating
Property	21. Rental property ownership 22. Facilities ownership 23. Residence ownership 24. Capital assets	Renting Serving Housing Investing
Markets	25. Stock brokerage 26. Commodity exchange 27. Commodity brokerage	Valuing Pricing Pricing
Money and Credit	28. Federal Reserve 29. Banks 30. Insurance 31. Home mortgages 32. Consumer credit	Lending Check clearing & lending Risk sharing & lending Lending Financing
Contracts	33. Labor contract 34. Construction awards 35. Purchase contract 36. Service contract	Price setting Cost estimating Terms setting Guaranteeing

from an institutional standpoint in respect to the procedure for fixing prices and wages.

• Consumer credit includes charge accounts, installment contracts, and loans from banks, finance companies, or other sources not covered by mortgages.

• Service contracts presumably include a term or duration and thus imply continued payment and performance. Purchase contracts concern only the terms of installment purchases, specify conditions for repossession, and other legal details.

All the variables are listed in Table 26 and identified either as inputs or outputs of one of the subsystems, with their source or destination indicated. Instead of a matrix of variables being shown cross-compared with subsystems and identified as inputs or outputs, Table 27 shows an example of a structural matrix, indicating primary relationships of inputs to outputs for the corporation. Source and destination information in Table 26 is repeated in Table 27.

By analyzing the economic system to this level, detailed questions can be seen regarding subsystems that were not evident before. Here are some examples.

• Questions arise in the case of the individual as worker, consumer, rentier, and manager: will he be able to go back to work, where will his income come from, how will he pay debts, collect rents, or manage his business. As an entrepreneur, how can he best respond to opportunities of the immediate future? What new regulations will govern his old business or possible alternative businesses to which he might convert it? Why not let the government handle all his problems?

• Labor unions will want to know how many members survived and what employment is open to them. Will wages be frozen? To whom will grievances be taken?

• Retail and wholesale merchants will wonder where their customers are, what their changed needs are, and whether there are any suppliers. Knowing the location of suppliers with adequate transportation will be another problem.

• Industries will wonder what to produce, how much to produce, whether or not they can obtain raw materials, power, and workers. They will also need to know where their suppliers are.

• Corporate managements will want to know what strategies they should adopt with respect to eliminating product lines, finding out the status of outstanding orders, and financial claims.

• Stock brokerage, commodity exchange and brokerage will question whether they can function at all, and if so will their prices affect other prices?

Table 26
INPUTS AND OUTPUTS TO SUBSYSTEMS OF THE ECONOMIC SYSTEM

Variables	Inputs to	Outputs from
1. Wages	Worker, manager	Business, industry, corporation
2. Labor	Business or industry	Worker
3. Management services	Business, industry, corporation	Manager, corporation
4. Consumers goods	Consumer, trade	Trade, industry
5. Sales price	Rental, trade	Consumer
6. Credit	Consumer	Consumer credit
7. Installment	Consumer credit	Consumer
8. Income	All	All
9. Rents	Rentier	Rental property
10. Dividends	Rentier	Corporation
11. Interest	Rentier	Home mortgages, bank, corporation
12. Purchase money	Rental property or capital	Rentier, money or credit
13. Investment money	Business, corporations	Entrepreneurs
14. Profits	Entrepreneurs, business, corporations	Business, industry, property, credit
15. Union dues	Unions	Worker
16. Wage rates	Worker	Union
17. Wholesale price	Wholesaler, industry	Retailer
18. Manufacture price	Industry	Wholesaler
19. Service charges	Services	Consumer, business industry
20. Services	Consumer business, industry	Services
21. Producers goods	Industry	Industry
22. New facilities	Business, industry	Construction
23. Construction awards	Construction	Contracts
24. Power	All	Utilities
25. Communications	All	Utilities
26. Service charges	Utilities	All
27. Transportation service	All	Transport
28. Freight charges	Transport	All
29. Value of new property	Property	Construction awards
30. Deposits	Federal Reserve, banks	Banks, all
31. Loans	Individuals, business industry	Money and credit
32. Premiums	Insurance	Consumer
33. Claims	Individual	Insurance
34. Mortgage loans	Consumer	Money and credit
35. Terms	Contract	All
36. Compliance	Contract	Legal system

Table 27

**STRUCTURAL MATRIX OF RELATIONSHIPS
AMONG INPUTS AND OUTPUTS**

a. For the Corporation

Inputs		Outputs											
Management services	1												
	1												
	1												
	1												
	1												
	1												
	1												
Income													
Investment money													
Profits													
Power													
Communication													
Transportation service													
Outputs Management Services Income Profits Power Communication Transportation service													
Inputs Management services Income Investment money Profits Power Communication Transportation service													
Utilities Service Charges Profit Payment Terms Investment Capital Terms Surplus Money													

Note: The figure "1" in a cell indicates a relationship between an input and an output.

- Holders of home mortgages will wonder if they are bankrupt, or whether they can collect from homeowners that have lost their homes or from the estates of those who did not survive. Or can they be saved by loss equalization payments?

- As limitations will probably be placed on withdrawals to avoid runs on banks, the question arises: does this mean that check clearings will be stopped and account transfers suspended. How will consumer creditors appraise credit risks in this environment, and will there be any new applications for credit?

- Who can enforce contract compliance with so many ready-made excuses for nonperformance? What would be the basis for legal action, and how long would it take to obtain a judgment?

Methodologies

Systems analysis provides a framework for raising such questions, but not for answering them. Two other choices appear possible: one is to develop a simulation of the postattack economic system, preferably in the form of a management game, through which people could play economic roles under conditions simulating the postattack environment with alternative settings of government policy; the other is to develop a thorough thought model through which a team of experts could reason out predictions of probable economic events under assumed environments and policies. Qualitative economic theory, particularly emphasizing institutional economics might be relevant, but it seems inconceivable that facts and relations could be projected into such an alien environment.

From this more detailed analysis of the economic system, it appears that the problems of projecting into a postattack environment require either a quantitative mechanistic microtheory or a more aggregative macrotheory. The first has been called a thought model but like microeconomic theories for example, it could probably be described in terms of formal, unspecified relations and used to develop macromodels by aggregation. The macromodels could be constructed independently, however, and used to analyze various aspects of postattack policy questions. In this form, models can be made quantitative either by statistical correlations, as in the Klein-Goldberger and Jan Tinbergen models, or by assumption for sensitivity testing, as in the Sidney Winter postattack model. If they are to include specific inserts of alternative government policies, part of the unknowns are questions regarding the behavior of managers and the effects of their behavior on the dynamics of adjustment. This seems to call for some sort of management game to explicitly introduce human elements. That can be avoided by introducing random elements and procedural rules as is done in Balderston and Hoggatt's simulation of market processes, but their problem was more straightforward and less concerned with a vast array of different types of human responses. Some sort of human participation seems more useful for purposes of this study than full computerization.

Synthesizing practical models from the plethora of variables would require that all possible people, relations, policies, environments, and other elements be included. It would be possible for a war gaming-type model or man-machine simulation to collect many of these aspects into one interacting whole. There are already computer models at NREC for damage assessments and the interindustry and scheduling aspects of recovery management. Condensation of these models, as for example in current efforts to condense PARM into the more aggregative format of STRENGTH, would probably be essential.

To construct a model to include sociocultural and political variables with the economic, at least 30 or 40 different roles would be needed, including a President, a judge, several legislators, two mayors, a school superintendent, a clergyman, a labor leader or two, a half dozen industry managers representing, say, appliances, furniture, steel, machinery, food, and petroleum, plus bankers, telephone and transportation representatives, farmers, and service industry entrepreneurs. Doubling up some roles might reduce the number of participants. The legislators, for example, could retain other roles, and wholesalers could operate service industries without serious role conflict. All players would share common roles as consumers, voters, and taxpayers, however, and the simulation would certainly constitute a major task for design, programming, and ultimate use in experiments.

The problem of introducing BAVO variables would be met in part by the players. It might even be possible to design stress situations that would elicit different responses from different players in such a way that relevant aspects of their BAVO positions would be exhibited. It would not be possible to simulate stress situations at all comparable to those of the postattack environment, but some degree of stress might be captured.

In management games, such troublesome points as the effectiveness of advertising are often treated by simply regarding effects on product acceptance as directly related to advertising expenditure. Similar devices could be used to deal with BAVOs.

Even ignoring the problem of BAVO variables, difficulties would arise in introducing adequate descriptions of legislation and policy. Discrete variables might help, but it would not be practical to consider many bits of legislation in one program.

An alternative to a management game would be to extend models like STRENGTH or PARM to include political and socioeconomic variables. Damage assessment routines can generate some postattack demographic data in forms that should provide inputs to relevant political and social studies. A detailed analysis of the debt structure and the effects of an attack on it would indicate the magnitude of financial problems. Damage assessment for housing requirements would indicate the magnitude of housing and billeting problems. Similar data on schools and school populations, churches, association headquarters, courts, city halls, and corporation headquarters would clarify other aspects of the

postattack environment. But all such damage assessment data would fail to reflect relations among the less tangible variables.

No single model appears promising. What seems needed is work on improving and generalizing a data bank, followed by a program of developing models for treating specific questions. Systems analysis provides a basis for organizing such a program.

Several methodological approaches to the study of total vulnerability have been identified briefly. Systems analysis has been used to identify important components and variables--institutions and their characteristic inputs and outputs. These have been paralleled with qualitative descriptions of the same institutions under normal conditions and as they might appear postattack--descriptions that could be greatly extended by drawing on the theory of social institutions, political science, and institutional economics to fill in details and help with projections.

A number of suggestions have been made: for more elaborate thought models of microequilibrium type that might integrate and extend these approaches; for collecting a great deal of aggregative data describing aspects of the present state of classes of individuals, corporations, and other institutions; for computer models of macrotheory-type for testing the sensitivity of gross phenomena to drastic changes in environment or policy; for gaming experiments of the management-game type that might be used to bring in human behavior explicitly. All these approaches have some applicability. How can they be best combined?

Different parts of possible methodological approaches bear differently on the different parts of the problem. Qualitative theory and even history can suggest possible effects, adjudge acceptability, and nominate countermeasures. More quantitative theory appears necessary for assessing the likelihood of unacceptable effects and the effectiveness of countermeasures. Specific effects can possibly be examined separately by applying portions of the thought model or specially constructed simulations. Games might best test the relevant countermeasures. Systems analysis has suggested many of the danger spots and provided a framework convenient for organizing and structuring the research program and for synthesizing an integrated picture from other results.

X GAPS IN KNOWLEDGE AND POSSIBLE RESEARCH APPROACHES

Gaps in knowledge that have hindered progress in this study have included gaps in observed data, in theory, and in methodological approach. Some appear critical, while others are less so. Some could be easy to close, while others look formidable. Table 28 identifies 18 of these gaps and rates their criticality and presumed complexity.

In cases where prospects for closing the gaps are poor, the importance of any effort at all is moderate at best, since partial success is relatively useless. Where the prospects for obtaining some data are good, with the possibility of a systems simulator and the possibility of using partial data to quantify at least part of the systems analysis, such an effort is very important. Similarly, the ease with which collective data could be generated makes an effort moderately important, even if Items 16 and 17 in Table 28 are not successful and even if such data prove difficult to relate either to insight or countermeasures.

Seven steps are suggested for closing the BAVO gap listed in Item 1, Table 28, though there may be others.

1. Conducting a survey by questionnaires or interviews
2. Listing association memberships of a large sample of individuals included in the survey under Step 1, or obtained independently
3. Developing a theory of BAVO formation for testing data collected in Steps 1 and 2 and for examining the consistency, transitivity, and secondary effects of cognitive dissonance
4. Making limited application of Steps 1, 2, and 3 to criminals, misfits, rebels, revolutionists, and other marginal or extreme behavior types
5. Identifying characteristics of institutions having important BAVO influence or depending on BAVO support for sharpening efforts under Steps 1 through 4
6. Identifying BAVO components bearing heavily on acceptability of existing or alternative institutions, thus reversing and possibly complementing the effort of Step 5
7. Design of man-machine games or simulators to test reactions to stresses approximating postattack institutional breakdowns

Table 28
GAPS IN KNOWLEDGE, THEIR IMPORTANCE, AND
THE PROSPECTS FOR CLOSING THEM

<u>Gap or Requirement</u>	<u>Importance</u>	<u>Prospects for Closing</u>
Factual		
1. BAVO data	Moderate	Very poor
2. Effects of BAVO change on strength of institutions	Moderate	Very poor
3. Effects of institutional changes on BAVO data	Moderate	Very poor
4. Data on other input or output variables	Great	Good
5. Aggregate data on collections of type institutions	Moderate	Excellent
Theoretical		
6. Structural relations among BAVO positions (psychology)	Moderate	Good
7. Theory of scaling (psychometric)	Moderate	Good
8. Qualitative relations among institutions (sociology, political, economics)	Great	Good
9. Factors in evolution of institutions	Great	Good
10. Nomination of countermeasures or remedies	Great	Good
11. Appraising likelihood of change	Great	Very poor
12. Appraising effectiveness of countermeasures	Great	Very poor
13. Adequate thought model	Moderate	Fair
Methodological		
14. Adequate systems analysis	Moderate	Fair
15. Interrelating thought model and systems analysis	Great	Good
16. Interrelating thought model collective data	Great	Good
17. Interrelating systems analysis and collective data	Great	Poor
18. Constructing simulations	Great	Good

Of these, Steps 5, 6, and 7 appear to be the only ones appropriate for OCD research, with the justification for Steps 5 and 6 being limited to use in guiding the design of experiments under 7.

Input and output variables (Item 4, Table 28) identified by systems analysis could be generated for samples of individuals, associations, corporations, local governments, and other institutions in vast detail, provided BAVO data are excluded. If this were done for a small sample of representatives of each type, the effect would be a collection of case studies that might describe current circumstances in some detail. The five-cities study might provide some useful information.

Case study material supplemented by projections into an assumed postattack environment could supply a framework for organizing demographic and other aggregative data envisaged under Item 5 of Table 28. Statistics on the number of cities, corporations, and associations having various characteristics, with data on their budgets, expenditures, tax rates, dues, and profits summed by appropriate classes or subclasses, would provide a vast amount of data on political, social, and economic institutions. The research problem is to decide what information is most important to considerations of total vulnerability and how to organize the important information. This is a major task, but it could be pursued only to the point of diminishing returns. Any program in constructing simulators for the postattack United States might guide this final data processing operation.

Item 7 of Table 28, scaling, relates primarily to BAVO analysis. Item 8 is coextensive with sociology, political science, and institutional economics. With or without guidance from systems analysis, simulations or thought models and their organizational effects, conventional qualitative or descriptive theory would give insight into the problems of postattack society that have been identified and suggest other important ones. It would also suggest countermeasures to the many unacceptable institutional changes that appear possible. As a complement to the qualitative theory, or perhaps as a focus for it, the study of factors underlying the evolution of institutions, whether identified from the history of institutional change or from theories of functional adaptation, could also aid in identifying potential danger areas and in suggesting countermeasures.

Items 11 and 12 present the area of greatest difficulty: assessing the likelihood of institutional changes, particularly unacceptable ones, and evaluating the probable effectiveness of countermeasures. If only qualitative and descriptive analysis is available for the forces inducing change, only qualitative impressions of their likelihood and effectiveness can be obtained. Perhaps qualitative analysis could eliminate some potential dangers as extremely unlikely, allowing attention to focus on more hazardous possibilities, and, in the absence of anything better, guide and schedule an allocation of research effort. It could also guide and focus efforts to develop simulators and to develop thought models to supplement present theory.

The thought models could supplement and quantify both qualitative theory and systems analysis, forming a bridge between them. The models would also organize aggregative data of Item 5 and possibly suggest better simulators. Although the thought models themselves have been referred to as mental simulators designed as though intended for some monstrous computer collecting input data from all people and all institutions as they respond to environmental change, the form of these models does not resemble any practical simulator and cannot be used simply to design one. The relation between the thought models and practical simulators is more like the relation between the kinetic theory of gases and thermodynamics; the aggregation of one approximates the other.

Systems analysis provides a format for identifying components of a system and variables. Because it can be carried further and further, subdividing systems into subsystems and subsystems and black boxes into subordinate subsystems, it can sift out variables and relationships and be a synthetic device for assembling them into a structure. By saying nothing about processes and mechanisms within the black boxes, it suppresses detail of interest to theory and the thought models. As the analysis is pushed to lower echelons, the disparity between it and the thought models should decrease but not disappear.

On the other hand, the collective data available on classes of individuals, associations, government bodies, and corporations do not provide inputs to systems analysis or to the thought models. The collective data are empirical and can be measured, but they do not reveal their origins. This would be derivable from the thought models if the hidden variables in them could be measured, mathematically manipulated, and aggregated. Since this may not be possible even in theory and is certainly not in practice, all that could be expected would be for the thought models to provide insight into the origins of any observed correlations in the collective data.

The advantages of simulations are that they synthesize a simplified analogue of reality that can serve as an experimental tool for testing the sensitivity of systems or model data to changes in the environment and for quantitative examination of interrelationships. The construction of an adequate simulator would draw on available theory, thought models, systems analysis, and aggregative social data to mirror significant relations. It is conceivable that a man-computer simulator of the war gaming-type could be designed to introduce some analogues of BAVO elements, to study the possible responses of leadership to postattack institutional problems. In the absence of a real stress environment of any appropriate magnitude, results could be misleading if treated as more than suggestive of possible phenomena. Less fanciful simulations, without human players, could be designed to test the sequence and response thresholds of institutional dysfunctions to the magnitude of environmental changes.

In general, research devoted to items with good chances of closing important major gaps seem to be those most worth pursuing. Definitive evaluation would require more definitive proposals than developed thus far. Development of specific proposals appears to be the appropriate first step.

Appendix A

MEASUREMENT OF THE RELATIONSHIP OF ATTITUDES TO INSTITUTIONS

Measurement of Attitudes

Although the nonquantitative, wholly subjective, and highly qualitative nature of the sociocultural attitudinal systems of groups seems to present insurmountable obstacles to mathematical description, certain mathematical concepts appear particularly germane, at least for suggestive analogies.

The axiomatic approach to structuring relational systems is similarly concerned with identifying a primary set of statements completely enough for derivation of theorems, and yet each statement must be sufficiently elementary in form and content to refer to a single piece or atom of thought. Such axiom systems can usually be stated in a number of alternative forms derived from each other and thus considered as being mathematically equivalent. The mathematical concept of a basis as employed in the theory of abstract spaces is also concerned with completeness and non-redundancy, though not uniqueness. The notion of a linear combination of basic vectors to represent points in a space and to describe notions of betweenness and convexity is also relevant.

The quantification of a belief system might be approached by identifying a finite set of independent elements, some of which are dichotomous while others are identified by a pair of extremes with a scale or ranking for assigning individual attitudes to positions intermediate between these extremes. The notion of independence might be introduced in the form of statistical independence. Two beliefs could be treated as independent for this purpose, if the probability that a randomly selected individual had one belief was the same whether or not he was known to hold the other belief. If a set of beliefs were independent, then the probability of having the combination of Beliefs 1, 2, ...m and not having Beliefs m + 1 ...n would be given by the product of probabilities of having (or not having) the relevant beliefs separately. If p_i is the probability of having belief i, and $q_i = 1 - p_i$ is the probability of not having that belief, then

$$p_i = \frac{n_i}{N} \text{ and } q_i = \frac{N - n_i}{N}$$

where n_i is the number of individuals having the belief out of a population of N. The number of persons having (1, 2, ...M) and not having (M + 1, M + 2, ...n) would be $N p_1 p_2 \dots p_m q_{m+1} \dots q_n$, if these beliefs were statistically independent.

For beliefs susceptible to graduation, the fraction of the population having a position to the right (in accordance with any convenient convention) of some point along the scale will follow some S-shaped curve typical of dosage mortality curves or any cumulative probability distribution. Two different beliefs would be statistically independent, if the joint probability density were equal to the products of the two separate probability densities. If

$$F(x) = \int_a^x f(u) du \text{ and } G(y) = \int_b^y g(v) dv$$

are the separate cumulative curves

$$\text{the quantity } \int_a^x \int_b^y f(u) g(v) du dv$$

is the probability that an individual be right of x on one scale while being simultaneously right of y on a second scale, provided that x and y are statistically independent.

A group of individuals have a collection of beliefs that might be characterized by average positions and by some measure of variability (or its opposite, homogeneity). With respect to dichotomous variables of the yes or no type, the average would represent the fraction having say the positive, yes, or "right" position (which could be scaled as 1, the negative position corresponding to zero). The continuously scaled variables would average to intermediate values corresponding to attainable positions on the scale, but the zero or 1 valued variable would not.

There would be particular interest in attitudinal variables that can distinguish demographically recognizable groups; that is, variables that tend to show low variability within each group. There would also be interest in variables that form a basic set tending to characterize group differences. Desirable characteristics would be strong correlations between variables outside the basic set with those inside the set, but with little or no correlation among combinations of variables selected from within the basic set. Shifts in social attitudes nationally, either with demographic change, population aging, or differential mortality in case of attack, could then be analyzed only by analysis of effects on the basic variables. The beliefs forming such a basis would also be favored candidates for study in attempting to uncover underlying forces affecting or influencing specific attitudes.

Observed changes in beliefs with age could be compared with differences in beliefs among age groups to distinguish normal effects of aging from differences due to changing times. Observed differences among first and second generation members of ethnic groups or of specified national extractions could indicate group effects and their persistence. Combinations of interclass comparisons or cross-sectional analyses of differences, combined with time series analyses of trends, could provide information

about many relationships and indications of the effects of different changes. Changes arising from factors internal to the individual or changes resulting from unprecedeted events or changes in the environment are not possible to forecast from such superficial analyses. A nuclear attack would of course be such an unprecedeted event--Nagasaki and Hiroshima, notwithstanding. Although some of the secondary effects on individual belief systems arising from direct effects on his environment might be predictable, general reactions to the attack itself cannot be inferred from these. Some responses might be inferred from study of behavior in disaster. Others could possibly be analyzed in terms of still more basic theories of personality formation than suggested by this empirical approach thus far.

Some of the norms typical of the social system can be identified by listing actions or behavior types that are highly valued or highly depreciated in our society. The strength of such values can perhaps be measured by the degree to which they are esteemed or condemned by most individuals, as indicated in Table 29. The degree of tolerance accorded deviant or unusual behavior types varies from individual to individual, and some variation could occur even with respect to the preferred extreme; that is, the sign of the scale. For example, racial prejudices would vary with the race of the individual and the region in which he lives. Measurement of the strength of the modal position could possibly be scaled by content analysis of literature or by direct attitude survey techniques.

Table 29
MODAL VALUATION OF INDIVIDUAL DIFFERENCES

<u>High Regard for</u>	<u>Tolerant of</u>	<u>Low Regard for</u>
Patriots	Rascals	Traitors
The courageous	Conformists	Atheists
The industrious	The honest	Religious fanatics
The efficient	The mentally retarded	Other fanatics
The practical	The sick	Drug addicts
The direct	Drunks	Alcoholics
Heroes	Teetotalers	Cowards
Philanthropists	Saints	Beggars
Humanitarians	Intellectuals	Libertines
The religious	Politicians	Bullies
The tolerant	The common man	Idlers or wastrels
Good sports	Individualists	Busybodies
Optimists	Bureaucrats	Martinet
Joiners		Delinquents
		Felons
		Monopolists

Logical analysis of the structure of a belief system might permit identification of primary beliefs from which other beliefs follow as corollaries. The full structure is probably too richly convoluted to be very amenable to such an approach. Inconsistencies in the belief system are widespread, even within the belief structure of a single individual. Such inconsistencies can of course be worthy of note and analysis because their existence is itself a source of strong motivation. A few keystones of the belief system could be interrelated, as in Figure 2, but this figure could be replaced by others equally convincing. The principal inference to be drawn is the primacy of certain obvious keystones, such as the fundamental belief in equality, equality in rights under the law, and equal opportunity.

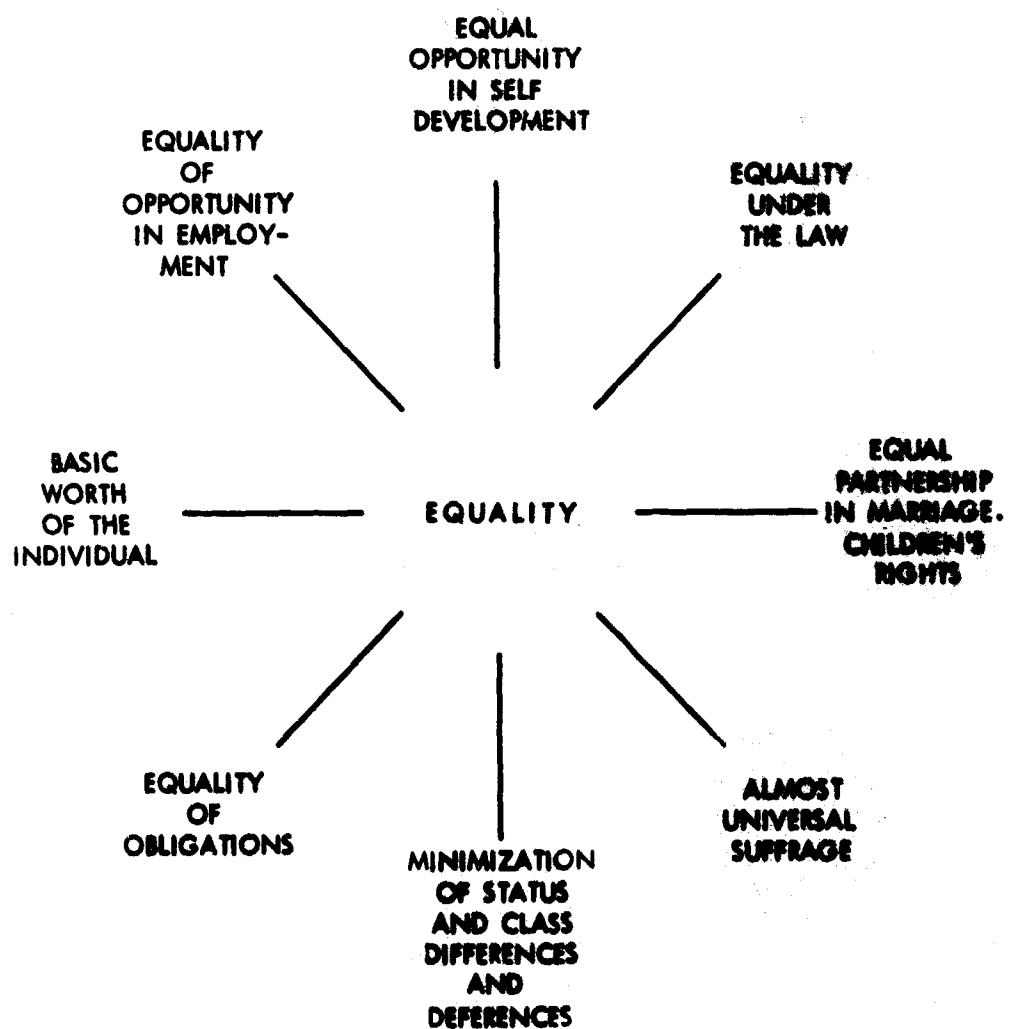
With more detailed and exhaustive attitudinal data of the types cited, there might be an attitude vector for each individual, say $X_i = (X_{1i}, \dots, X_{ni})$ the components of which (that is, the X_{ki}) would represent the value that the i th individual places on the k th quality, attribute, or action. The components would thus represent the individual's reaction to traits of other individuals, his approval or condemnation of possible acts, his acceptance of institutions or social arrangements, or his dissatisfaction with them. These vectors could be averaged over groups of individuals to obtain group means $\bar{X}_G = (\bar{X}_{1G}, \dots, \bar{X}_{nG})$. The group averages could be changed by an attack either by changes in the membership of the group or by changes in individual vectors. The changes in group composition could be deduced from attack survival data, wealth survival, the economic situation, and other relatively objective characteristics of the postattack environment. Changes in the individual's physical environment will be more subjective and harder to anticipate. Some of them, however, will arise from changes in relationships or associations with others, from transattack experiences, and from changes in the social environment and the values of others. These can scarcely be anticipated for each individual, but they can perhaps be anticipated for groups.

To carry out a well-planned approach of the type sketched so far, however, would be a monumental task, fraught with political, practical, and methodological difficulties.

Measurement of the Relationship to Institutions

A plausible approach to relating these attitudes to institutions would be to classify attitudes as favorable or unfavorable and either inapplicable or indifferent to particular institutions in their present form or to possible variants. A tentative experiment with such relational analysis is presented in Table 30, which shows the influence of attitudes on institutions. In this table, attitudes, where prevailing consensus reinforces certain characteristics or norms of the institution, are marked with a plus sign (+); attitudes, where their present state opposed such characteristics or norms, are indicated with a minus sign (-); and attitudes that are not relevant or applicable, or that have insignificant effects, are indicated by a zero.

FIGURE 2
STRUCTURE OF KEY ITEMS IN OUR BELIEF SYSTEM



TYPICAL INSTITUTIONS AND THE RELATIONSHIPS OF THEIR DOMINANT CHARACTERISTICS TO PERSISTING SOCIAL ATTITUDES

Table 30 (continued)

Table 2a (continued)

CHARACTERISTICS OF SPREADING AND TILTING - 41

THE HISTORY OF THE CHURCH IN SPAIN.

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The preparation, completion, validation, and extension of such tables to cover all significant interactions among attack effects, attitudes, and institutions would be difficult, even with voluminous attitudinal data. The interpretation of such tables moreover would also require some notion of the net combined effects of many attitudinal changes. If the strength of all the attitudes could be measured along a logarithmic scale in the direction of the positive effect on some norm or institutional characteristic, and if a correlation could be found between percentage changes in the position of the attitude and percentage changes in the strength of the norm, the regression coefficients between such percentage changes could be a measure of relative sensitivities, a measure with the general character of an elasticity as the term is used in economics. A possible approximation could be obtained from the assumption that such percentage effects are collective and that the logarithm of the strength of the norm is equal to the sum of the logarithms of the scale position of the attitude. If y is the strength of the norm, and $x_k = \bar{x}_k$ are the positions of the modal attitudes, there could be

$$\log y = \log y_0 + \sum_k \alpha_k (\log \bar{x}_k - \log \bar{x}_{k0})$$

where the zeros refer to current states and where the α_k are sensitivity measures. This is equivalent to the assumption that

$$y = y_0^n (x_k/x_{k0})^{\alpha_k}$$

Relations of this kind have been applied to psychological and socio-political attitudes by Stevens and others in scaling research. If the α_k add to 1, then a 1 percent parallel shift in all the attitudes simultaneously would produce a 1 percent change in the strength of the norm. This is a special case and thus unlikely. Other cases would correspond to non-linear response relationships.

Individuals have attitudinal positions x_{ik} with respect to attitude k that they embrace with varying intensities s_{ik} , where intensity measures the inertia with which they resist influence to change. Groupings G of individuals have mean positions \bar{x}_{Gk} that the groups embrace with varying intensities derived from attitudes of their individual members. As a convenient device for aggregation, there might be used:

$$\log \bar{x}_{Gk} \sum_{ik} s_{ik} = \sum_{ik} s_{ik} \log x_{ik}$$

a relation requiring empirical verification but useful for exposition. Means \bar{x}_{Gk} can change because of changes in the composition of G , in some of the x_{ik} or in the s_{ik} . The manner in which attitudes influence each

other within a given individual is a key problem in personality analysis. The manner in which they influence each other across different individuals is a key problem in personality formation. The manner in which environmental changes, group interactions, and interactions between individuals and institutions influence group attitudes is a key problem in the formation of social values, norms, conventions, and institutions, and probably marks the broad line where psychology cedes jurisdiction to sociology.

Appendix B

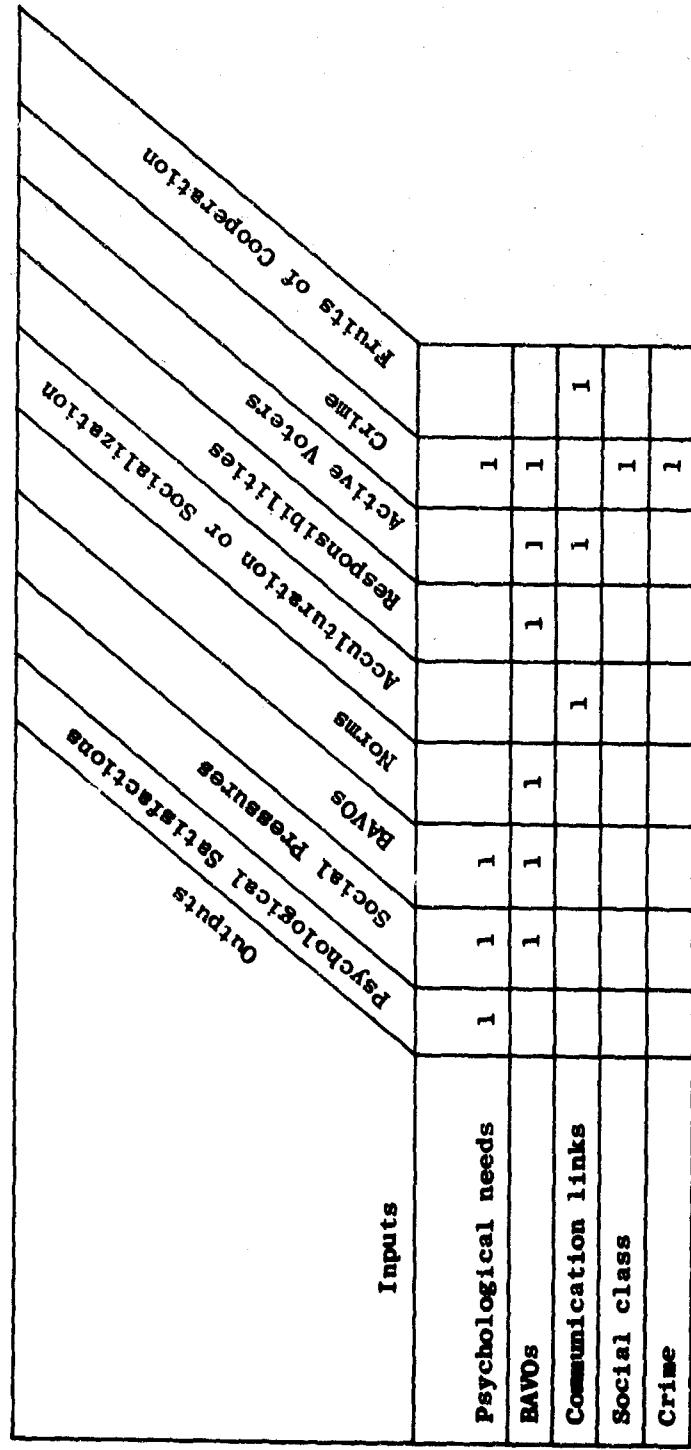
**STRUCTURAL MATRIX SHOWING RELATIONSHIPS BETWEEN THE INPUT AND OUTPUT
VARIABLES FOR INSTITUTIONS OF THE U.S. SOCIAL SYSTEM:**
a. Language

		Outputs					
		Socio-logical Statistical Relationships	BAVOs	Norms	Conventions	Acculturation Links	Trained individuals
		Psychological needs	BAVOs	Norms	Conventions	Acculturation Links	Trained individuals
Inputs		1	1	1	1	1	1
	Psychological needs	1	1	1	1	1	1
	BAVOs	1	1	1	1	1	1
	Communication needs				1	1	1
	Expressions of intent, desire				1	1	1

b. Family

Inputs	Biological needs of individuals	Psychological needs of individuals	BAVOs	Communication links	Trained individuals	Offers of services	Rights	Legislation	New construction	Income	Payments	Wealth
Biological Social Statistical Services	1	1	1						1			
Community Needs												
Expressions of Needs												
Social Interaction of Internet												
Ethnic Groups												
Church Membership			1									
Taxes												
Savings												
Debt												

c. Group



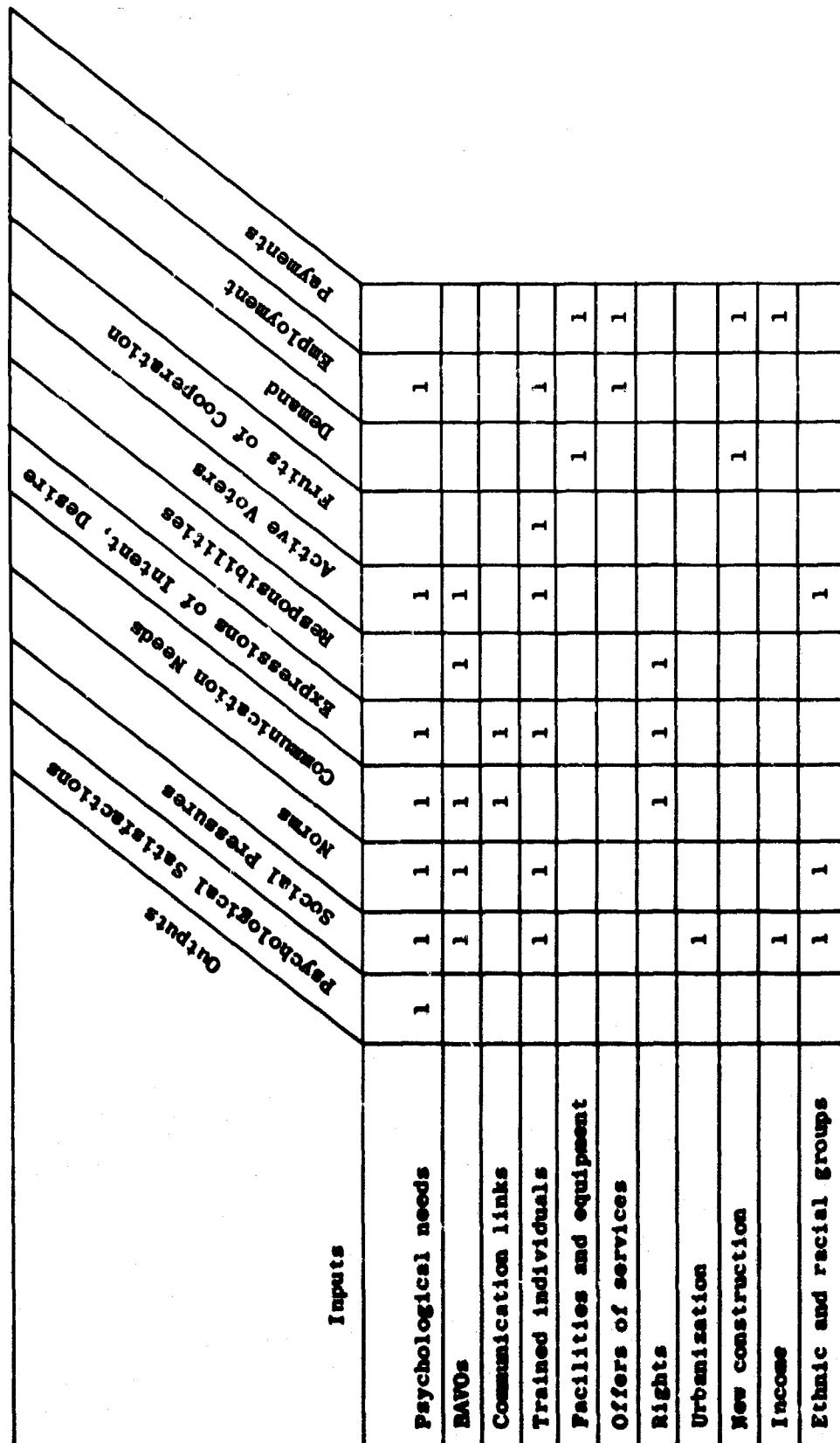
d. School

Inputs	Psychological needs	BAVOS	Communication links	Offers of services	Rights	Elected officials	Taxes	Government manpower	Legislation	Government expenditures	Consumables	Facilities and equipment	New construction
SOCIOLOGICAL SITUATIONS	1	1	1	1	1	1	1	1	1	1	1	1	1
NOTES		1	1	1									
Acculturation or Socialisation			1	1									
Occupation				1									
Trained Individual					1								
Type of Education						1							
Government Services							1						
Demands								1					
Employment									1				
Payments										1			

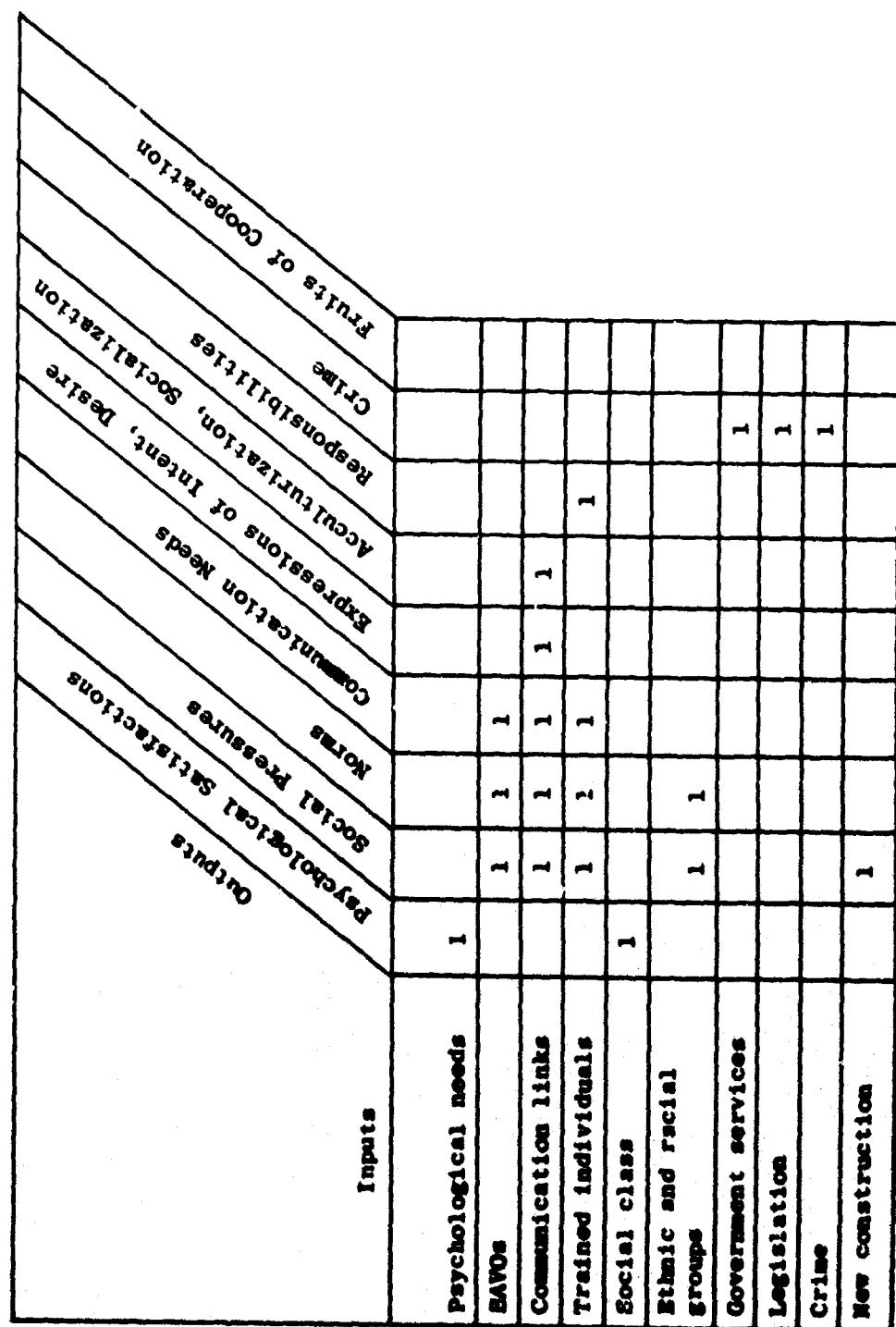
e. Church

	Psychological needs	Communication links	Trained individuals	Facilities and equipment	Offers of services	Church membership	Types of churches	Rights	New construction	Incomes
Inputs										
Social situations	1	1	1	1	1	1	1	1	1	1
BAVOS	1	1	1	1	1	1	1	1	1	1
NOTES	1	1	1	1	1	1	1	1	1	1
Expressions of Intent,	1	1	1	1	1	1	1	1	1	1
Acculturation or Socialization	1	1	1	1	1	1	1	1	1	1
Responsibilities	1	1	1	1	1	1	1	1	1	1
Types of Education	1	1	1	1	1	1	1	1	1	1
Fruits of Education	1	1	1	1	1	1	1	1	1	1
Demand	1	1	1	1	1	1	1	1	1	1
Bargain	1	1	1	1	1	1	1	1	1	1
Payments	1	1	1	1	1	1	1	1	1	1

Society of Association



g. Community

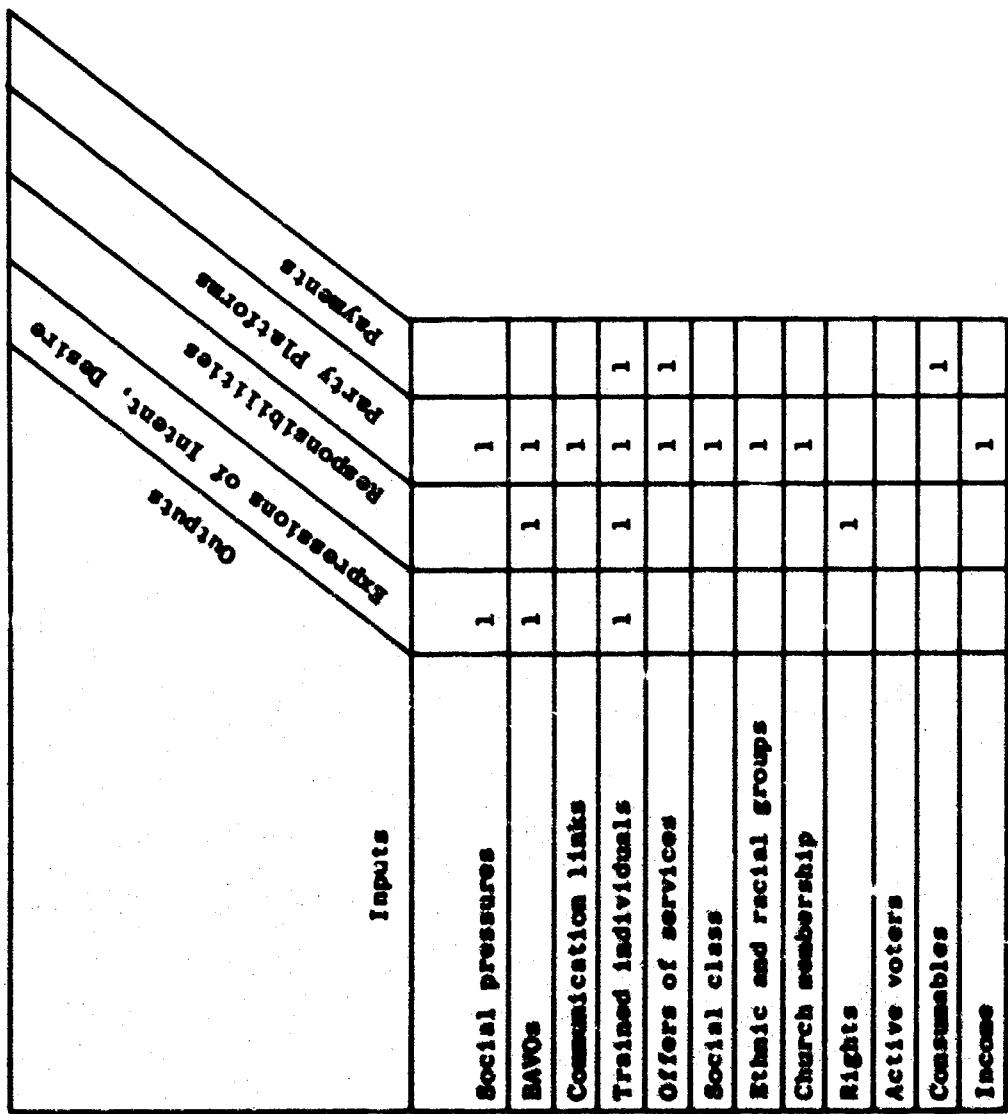


b. Previous group

1. Legal System

	Imports	Exports	Services	Government support	Crimes	Consumables
Trained individuals	-	-	-	-	-	-
Facilities	-	-	-	-	-	-
Offers of services	-	-	-	-	-	-
Elected officials	-	-	-	-	-	-
Taxes	-	-	-	-	-	-
Governance	-	-	-	-	-	-
Legislations (or types) of Govt.	-	-	-	-	-	-
Government Services	-	-	-	-	-	-
Police (or types) of Govt.	-	-	-	-	-	-
Strengthening of the Military	-	-	-	-	-	-
Governments Debt	-	-	-	-	-	-
Wages and Salaries	-	-	-	-	-	-

J. Political Party



k. Municipality

	Inputs	Type of Broadcast Needs	Government Services	Government Debt	Government Expenses	Government Expenditures
Communication links	1					
Trained individuals	1					
Facilities and equipment	1					
Offers of services	1					
Level of education	1					
Elected officials	1					
Strength of pressure groups	1					
Government responder	1					
Taxes	1					
Form (or type) of government	1					
Organizations of government	1					
Crime	1					
Services	1					
Consumables	1					
New construction	1					
Proceeds of bond issues	1					
Savings	1					

1. County

Inputs	Outputs	Governance Needs	Governance Services	Governance Debt	Governance Expenses	Wages and Salaries	Demand	Deployment
RAVOS		1	1					
Communication links		1						
Expressions of intent, desire	1							
Trained individuals		1			1	1		
Facilities and equipment		1	1					
Offers of services		1	1			1		
Elected officials		1	1			1		
Strength of pressure groups		1	1	1		1		
Taxes			1	1				
Government manpower		1			1			
Form (or type) of government								
Organization of government								
Crisis							1	
Consumables					1	1	1	
Services							1	
New construction						1	1	
Proceeds of bond issues						1	1	
Savings							1	

m. Special District

Inputs		Outputs														
	BAVs	Communication links	Expressions of intent, desire	Trained individuals	Facilities and equipment	Offers of services	Elected officials	Strength of pressure groups	Taxes	Government manpower	Organization of government	Consumables	Services	New construction	Proceeds of bond issues	Savings
Demands Employment																
Merges and Sales Leases																
Government Debt																
Legislative Government Services																
Type of Education																
Responsibilities Community Needs																
Communication Links	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Expressions of intent, desire			1													
Trained individuals				1												
Facilities and equipment					1											
Offers of services						1										
Elected officials							1									
Strength of pressure groups								1	1	1	1	1	1	1	1	
Taxes								1	1	1	1	1	1	1	1	
Government manpower									1	1	1	1	1	1	1	
Organization of government									1	1	1	1	1	1	1	
Consumables									1	1	1	1	1	1	1	
Services										1	1	1	1	1	1	
New construction										1	1	1	1	1	1	
Proceeds of bond issues											1	1	1	1	1	
Savings												1	1	1	1	

o. Federal Government

Inputs	Outputs	Government Needs	Legislative Services	Government Debt	Facilities and Equipment	Wages and Salaries	Royalties and Subsidies	Demand	Employment
BAVOS	1	1	1	1					
Communication links	1								
Expressions of intent, desire	1								
Trained individuals	1								
Facilities and equipment									
Offers of services	1								
Ruling party	1	1	1	1					
Party platforms	1	1	1	1					
Elected officials	1	1	1	1	1	1			
Strength of pressure groups	1	1	1	1	1	1			
Taxes							1		
Government manpower	1						1		
Form (or type) of government	1						1		
Organization of government	1	1	1	1					
Strength of the military	1	1	1	1	1	1			
Crime	1							1	
Facilities and equipment							1	1	1
Consumables	1								
Services	1	1	1	1	1	1	1	1	
New construction							1	1	1
Proceeds of bond issues							1	1	
Savings							1	1	

p. Union

Inputs		Outputs						
		RAVOS	BAVOS	Communication links	Officers of services	Rights	Legislation	Dues
Community action Needs	BESTRACTIVE VOTERS	1	1	1	1	1	1	1
Expressive Needs	HESCONSIBILITIES	1	1	1	1	1	1	1
Needs of Internet.	TAXES							
New Constitution	SERVINGS							
Demand	EMPLOYMENT							

r. Industry

	Inputs	Biological needs	Rain	Communication links	Occupation	Facilities and equipment	Offers of services	Rights	Government services	Legislation	Government expenditures	Crisis	Services	Seafinished products	New construction	Wages and salaries	Interest	Rents	Royalties	Profit	Dividends	Services	Demands
Biological needs	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Corporate social actions	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Professional associations of interest	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Activists	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Organizations and businesses	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
New construction	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wages and salaries	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Interest	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Rents	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Royalties	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Profit	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Dividends	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Services	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Demands	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

a. Corporation

	Inputs	BAVOS	Proceeds or bond issues	Savings
Outputs				
Commercialization needs				
Businesses	1	1		
Taxes		1		
Urbanization		1		
Crime		1		
Profits		1		
Dividends		1		
Proceeds of Bond Issues		1		
Incomes		1		
Savings		1		
Employment		1		
Employees		1		

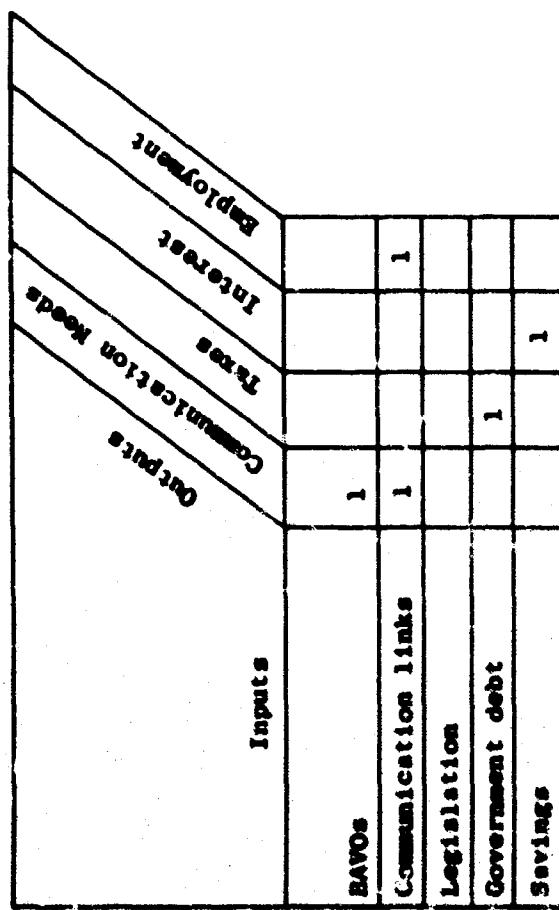
t. Property

Inputs		Psychological needs	Rights	Facilities and equipment	Savings
Outputs	Psychological Social Services	1	1	1	1
Taxes	Urbanization	1	1	1	1
Mortes	Services	1	1	1	1
Utilities	Rents	1	1	1	1
Incomes	Income	1	1	1	1
Meals	Meals	1	1	1	1

u. Markets

Inputs		BAVOS	Communication links	1	1	1	1	1	1	1	1
Taxes	Urbanization needs			1							
Offices	Communication needs			1							
Employment	Urbanization				1						
Markets						1					

v. Money and Credit



w. Contract

Inputs	Outputs	Communication links	Legislation	BAVOS	Responses to public needs	Community action needs	Bespoke needs	Employment
		1	1	1	1	1	1	1

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13. ABSTRACT

This study was an attempt to apply systems analysis to the study of total vulnerability. The results indicated that the systems concept could be used to generate, through an expandable sequence of check lists, many pertinent questions about the structure of our society and its intrinsic vulnerabilities. The analysis was centered on the individual as a political, social and economic agent and 23 primary institutions that interact with him and with each other. The first step was to identify as well as possible all input and output variables for the individual and the institutions, and all the sources of each input and all the destinations for each output. Execution of this step encountered many conceptual and semantic difficulties, and made it quite clear that initial hopes of investigating possible inter-relationships quantitatively were over optimistic or premature.

The systems descriptions were related to the primary and secondary effects of thermonuclear attack. They were compared with more traditional descriptions of the institutions and with two simplified postattack scenarios representing the primary effects of a heavy counter force and a heavy counter industry attack.

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